THE IRON TRADE REVIEW

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Mills Advance Plates, Shapes and Bars $1 a Ton

Specifications for Finished Materials Unusually Heavy and Deliveries Are Further Deferred—Southern Iron, Fourth Quarter, Advanced

High tide consumption of finished materials, which is greatly in excess of the capacity of the mills, has resulted in advances of $1 a ton on iron and steel bars, plates and shapes. The leading interest announced these increases in prices, effective June 26, and several independent manufacturers have followed with similar advances, some effective July 1. A heavy buying movement of all lines affected has been precipitated and consumers are hurrying to cover third and fourth quarter requirements. Several large orders, with deliveries extending into next year, have been declined by the mills. Shipments are being further deferred and slight premiums are being obtained for early deliveries. An eastern mill was awarded a contract for 3,500 tons of plates, early in the week, at 1.30c, Pittsburgh, as western makers could not promise the material in less than two months. An avalanche of specifications for finished products, covered by contracts terminating July 1, has been received by the mills during the past few days. Inability to obtain a sufficient tonnage of plates and shapes has compelled steel car makers in the central west to place orders in the east, where considerable difficulty is being experienced in securing the desired delivery on one lot of 10,000 tons of plates.

Pig Iron

Aside from heavy buying by eastern pipe makers, which involves approximately 13,000 tons, the pig iron market in all centers continues quiet, but firm. The New York Air Brake Co. closed for 7,000 tons in the New York market, and the Crane Valve Co. has made inquiry for 5,000 tons. Probably 10,000 tons of pipe iron is now pending in the Philadelphia market. An independent steel manufacturer in the Pittsburgh district is sounding the market for 25,000 tons of basic and it is probable that the iron will be furnished by a furnace east of Pittsburgh. The Republic Iron & Steel Co. has announced that it has no southern iron for sale through the third quarter and is now asking $12, Birmingham, for shipment through the last three months of the year. There is little indication that coke makers will recede from their demands for higher prices for the last half and this will necessitate increased pig iron values if producers are to remain above the cost line in selling prices.

Iron Ore Movement

The movement of ore from Lake Superior mines to the shipping docks has been marked with considerable strain during the past week, due primarily to lack of equipment on the part of the Great Northern railroad to handle the Steel Corporation's heavy shipments from the Hill mines. This lease is to be surrendered in 1915 and the Corporation is behind in its minimum movement under its terms. This condition has seriously affected the vessels trading to Allouez, and many of them are being held up, Corporation as well as independent boats. The congestion also has affected other shipping ports. The Great Northern railway is doing all that it can to relieve the situation, even to the extent of routing cars from Arizona to Lake Superior, as well as adding new equipment. The ore movement is very heavy and all records will undoubtedly be broken this season.

Labor Conditions

That iron and steel manufacturers are confronted with higher costs of production is indicated by the acute scarcity of common labor and the demand for higher wages made by this class of workers. All industries are affected similarly and the output in all lines is being curtailed. The agreement which has been reached on the iron scale provides for an advance of 25 cents a ton for puddlers on a 1 cent card and the scale has been signed by the western bar iron makers as well as the Republic Iron & Steel Co. At a meeting of the finance committee of the Steel Corporation, a resolution was adopted that clearly outlines plans for improvements in labor conditions at the mills, mines, docks, etc., of subsidiaries and provides for the elimination of the long-turn, and a committee was appointed to consider also if any arrangement can be made to reduce the 12-hour day.

PITTSBURGH

Iron and Steel Bars and Plates Advanced $1

Office of THE IRON TRADE REVIEW,
2148-49 Oliver Bldg., June 25.

A slower buying movement has developed during the week, but this is expected by the steel manufacturers at this season. The crowded condition of the mills causes the quieter tone to be a welcome feature, as in nearly every line of finished material deliveries are falling behind. The increased confidence in the stability of the trade is shown by the announcement by the leading interest of an advance of $1 a ton on both plates and shapes, effective June 26, while iron bar makers have also advanced prices an equal amount the past week. Pig iron is showing increasing firmness and averages higher in all grades for prompt and third quarter shipments. Sheets and tin plate are strong and concessions on wire products are no longer being made. The coke situation remains unchanged.

Pig Iron.—While buying of pig iron has been confined to small tonnages there is evidence of a much stronger tone throughout the market. The bulk of the inquiries is for foundry, which is moving much better than for some time. A sale of 2,000 tons of malleable was reported at $13.25, valley, covering the last half, but this could not be duplicated, and the prevailing price now quoted on malleable is $13.50. There have been several sales of foundry at $13.50, covering the third quarter. Most of the foundries pay the higher price without question. Gray forge is quiet at $13 to $13.25, with very little to offer on the part of furnaces. Basic iron is quiet but firm at $13.50. Bessemer iron remains nominally at $14.25. The situation in the basic market is unique in that there is possibly no more than 15,000 to 20,000 tons of this grade available for shipment that is not covered by contracts for the third quarter, without additional furnaces going in, and with the present price of coke the furnace operators are disposed to go slow in blowing in their stacks. We quote the market as follows:

(Prompt Shipment.)

Bessemer, valley	$14.25
Bessemer, Pittsburgh	15.15
Basic, valley	13.50
Basic, Pittsburgh	14.15
No. 2 foundry, Pittsburgh	14.40
Gray forge, Pittsburgh	13.90
Malleable, Pittsburgh	14.15

(Third Quarter.)

Bessemer, valley	$14.25
Bessemer, Pittsburgh	15.15
Basic, Pittsburgh	14.40
No. 2 foundry, Pittsburgh	14.40
Gray forge, Pittsburgh	13.90
Malleable, Pittsburgh	14.40

Ferro-Alloys. — Ferro-alloys are slightly more active with exception of ferro-manganese for spot shipment. The price on spot manganese varies from $50 to $55, according to the tonnage. Forward shipments are quoted generally at $48.50, Baltimore. There is more activity in 50 per cent ferro-silicon, and prices have moved upward on spot business from $1 to $2.50 a ton, a sale during the past week at $72.50 being reported, and the entire market shows a much stronger tone. In domestic grades of silicon, prices are unchanged as follows: $20 for 10 per cent, $21 for 11 per cent and $22 for 12 per cent, furnace.

We quote ferro-manganese at $48.50, Baltimore, and $55 to $58 for prompt delivery. The freight rate from Baltimore to Pittsburgh is $1.95 per ton.

Fifty per cent ferro-silicon is quoted nominally at $71 to $72.50, Pittsburgh, for prompt and $70 forward delivery; 12 per cent, $22; 11 per cent, $21; 10 per cent, $20, f. o. b. Globe, Jisco and Ashland furnaces. The freight rate to Pittsburgh is $1.90. The foreign grades are held at $1 or more a ton over domestic prices.

On ferro-titanium we quote 8 cents per pound for carload lots; 10 cents per pound for 2,000 pound lots and over, and 12½ cents per pound in lots up to 2,000 pounds.

Plates.—The plate market is stronger. The leading interest announced an advance of $1 a ton on plates advancing the base from 1.25c to 1.30c, effective June 26. Specifications are heavier and most of the mills are falling further behind on deliveries. There is little demand for ship plates and the car buying movement has slowed up temporarily, although the Pennsylvania railroad has ordered 875 cars from its Altoona shops, for which steel must be specified, and a small order for 15 all-steel stock cars was placed with the Standard Steel Car Co. The following inquiries are now pending for cars: Georgia-Southern & Florida railroad, 240 freight cars; Southern railway, 450 cars and a total of 96 steel passenger coaches for various roads. Steel plate reservations by car builders are heavy. Recent car orders require reservations of more than 60,000 tons of materials, 6,000 tons having been added this week in plates and shapes.

We quote the market as follows:

Tank plates, ¼ inch thick, 6¼ to 100 inches, 1.30c. Extras are as follows per 100 pounds: Boiler and flange steel plates, 0.10c; A. B. M. and ordinary firebox steel plates, 0.20c; still bottom steel, 0.30c; marine steel, 0.40c; locomotive firebox steel, 0.50c; all sketches excepting straight taper plates varying not more than 4 inches in width at ends, narrowest end being not less than 30 inches 0.10c; circles, 0.20c. Plates in widths over 100 inches up to 110 inches 0.05c over 110 inches up to 115 inches, 0.10c; over 115 inches up to 120 inches, 0.15c; over 120 inches up to 125 inches, 0.25c; over 125 inches up to 130 inches, 0.50c; over 130 inches, 1c. Gages under ½ inch to and including $\frac{7}{16}$-inch plate on thin edge, 0.10c; under $\frac{7}{16}$ and including No. 9, 0.25c. Five cents extra for less than carloads. Terms net cash in 30 days.

Sheets.—Low priced contracts on black sheets which protected many consumers during the first half of the year, will terminate July 1, and a large amount of new business is being placed for third quarter delivery at prevailing quotations. The market is in a very satisfactory condition and 1.95c on No. 28 black sheets is more nearly the minimum than it has been since that price was established. Galvanized sheets are strong at 3c in the Pittsburgh territory, although there are some sales noted in the middle west for prompt shipment at 2.95c in small lots. Corrugated sheets are not moving so rapidly as the season would warrant, but this is largely due to backward weather conditions which delayed the placing of orders by both jobbers and consumers, and a large volume of inquiry is appearing which should have been a feature of a month or six weeks ago. The scarcity of labor in the sheet trade has been a very serious factor, and has reduced production sharply. The leading interest is operating at the greatest possible capacity with the supply of steel and labor available. We quote the market as follows:

Flat Sheets

Black Sheets.—Nos. 10-12, $1.60 per 100 pounds; Nos. 13-14, $1.65; Nos. 15-16, $1.70; Nos. 17-21, $1.75; Nos. 22-24, $1.70 to $1.80;

Nos. 25-26, $1.75 to $1.85; No. 27, $1.90; No. 28, $1.95; No. 29, $2.00; No. 30, $2.10.

Blue Annealed.—Nos. 3-8, $1.35 per 100 pounds; Nos. 9-10, $1.40; Nos. 11-12, $1.45; Nos. 13-14, $1.50; Nos. 15-16, $1.60.

Galvanized.—Nos. 10-11, $2.00 per 100 pounds; Nos. 12-14, $2.10; Nos. 15-16, $2.25; Nos. 17-21, $2.40; Nos. 22-24, $2.50; Nos. 25-26, $2.70; No. 27, $2.85; No. 28, $3.00; No. 29, $3.10; No. 30, $3.30.

Roofing Sheets

Galvanized.

Net extras on all gages per 100 pounds.

Corrugated 2-inch, 2½-inch, 3-inch and 5-inch corrugation, 5c; 2 V crimped without sticks, 5c; corrugated 1¼-inch corrugation, 10c, 3 V crimped without sticks, 10c; pressed standing seam with cleats, 15c; plain roll roofing with cleats, 15c.

Painted Roofing.

12 to 18 gage, inc., 5c; 19 to 24 gage, inc., 10c; 25 to 28 gage inc., 15c.

Tin Plate.—Tin plate is very firm and a number of the larger independent mills have advanced their minimum quotation for third quarter and last half to the higher price of $3.50 per base box. New business is not large, but the liberal specifications that have been received for the third quarter and far into the last quarter insure the full operation of the tin plate mills for most of the year. The leading interest is not taking tin plate orders for delivery before the fourth quarter. There is some new business going at $3.40, however, for prompt shipment. Terne plate is in fairly active demand.

We quote the market as follows:

Coke tin plate, 100-pound basis, 14 x 20, $3.40 to $3.50, f. o. b. mill, Pittsburgh district.

Rails and Track Material.—Specifications for open-hearth standard section rails are very heavy, and new business is good. The leading interest is still far behind on shipments for June. Bessemer sections are in good demand and the tonnage for June is expected to exceed that of May. The light rail trade continues to improve. Buying of track material is brisk. The demand is strong for prompt shipment and the consumption is large by all the leading roads. Inquiries for last half requirements indicate a continued heavy consumption of track material. Leading rail makers, particularly large independents, are slow in accepting new shipping obligations, as they are short of raw material and short of labor, both of which interfere with the full operations of plants. The market is quoted as follows with the base price on open-hearth steel rails 1.34c per pound at the mill:

Fifty-pound and heavier, 1.25c per pound; carloads and less than 500 tons, 1.34c per pound; light rails on base weight of 40 to 45 pounds, 1.15c, the schedule on the other weights being irregular and subject to negotiations; angle bars for standard sections, 1.50c, Pittsburgh; track bolts, 2.20c to 2.25c, Pittsburgh.

Railroad Spikes

4½, 5 and 5½ and 9-16	$1.45
3, 3½, 4, 4½ and 5 x ½	.10
3½, 4 and 4½ x 7/16	.20
3, 3½, 4 and 4½ x ⅜	.30
2½ x ⅜	.40
2½, 3 and 3½ x 7/16	.60
2 x 5-16	.80

Steel.—The scarcity of semi-finished steel is more pronounced than a week ago, and the market ranges somewhat higher. Premiums are offered on prompt shipment of small billets and sheet bars, including both Bessemer and open-hearth. Bessemer sheet bars have been quoted at $24 and $25, Youngstown and Pittsburgh, and very little tonnage is available before the middle of the third quarter, while some of the larger makers are sold through the third quarter and are unable to take any new business before the last quarter of the year. The strong tone of the Bessemer steel market is one of the features of the week, the demand for this class of steel being more active than for open-hearth. Forging billets are slightly firmer and a small lot was reported sold at $27.50, Pittsburgh, with the market nominally at $28. The leading interest is still out of the market on both billets and sheet bars. We quote the market as follows:

Bessemer 4 x 4 billets with 0.25 carbon and less are quoted at $22.00 to $23.00, with the usual extra for size and analysis, and open-hearth rolling billets, $22.00 to $23.00. Bessemer sheet and tin bars are quoted at $22.00 to $23.00, and open-hearth sheet bars are quoted at $22.00 to $23.00, f. o. b. Pittsburgh, for second quarter, with full freight to destination added. Forging billets are quoted at $27.50 to $28.00, Pittsburgh.

Hoops and Bands.—Prices are firm on hoops and bands, and specifications are heavy. New business is satisfactory and some buyers have increased their tonnage requirements which are being taken at the full market price. Quotations, however, remain unchanged, with hoops at 1.25c to 1.30c and bands at 1.20c. The leading interest is increasing its capacity by installing new hoop mills at the McCutcheon plant, North Side, Pittsburgh. We quote the market as follows:

Hoops in carload lots, 1.25c to 1.30c, Pittsburgh; in less than carload lots, 1.40c; bands 1.20c, base, with net extras, as per standard steel.

Merchant Bars. — The demand for merchant bars is heavy. The volume of business has increased and the leading interest advanced the price $1 a ton to 1.25c, effective June 26. A good many mills are behind on shipments and makers are generally asking from six to seven weeks on deliveries. This is believed to have influenced the placing of heavy specifications by the jobbing trade. Iron bars have shown a sharp improvement, and during the week advanced $1 a ton, the absolute minimum being 1.35c, and new business is now generally being taken at 1.40c, Pittsburgh. Cold rolled shafting is firm and specifications are heavy on old contracts, while new business is coming out better than heretofore. Consumers who have carried large stocks have absorbed most of this surplus and have reached the low point which will necessitate buying on a larger scale. Most of the shafting mills are operating at capacity. We quote the market as follows:

Common iron bars, 1.35c to 1.40c, Pittsburgh; Bessemer and open-hearth steel bars, 1.25c; plow and cultivator, 1.25c; channels, angles, zees, tees, under 3 inch, 1.25c, all f. o. b. mill. The following differentials are maintained on steel: Less than 2,000 pounds of a size, 0.35 advance. Cold rolled, and ground shafting, 65 per cent off in carloads and 60 per cent in less than carloads, delivered in base territory.

Muck Bar.—The demand for muck bar is strong. Buying is more active and prices are firm. Iron bar manufacturers are unable now to maintain their own supply and reserve stocks of muck bar have disappeared so rapidly that any weakness that might have existed has been eliminated. We quote $29 to $30, Pittsburgh, for muck bar.

Structural.—The structural trade has shown many indications of further improvement, and according to leading fabricators the market looks better than for many months. New business is of a varied nature, and while large tonnages are not numerous, the aggregate of small business is increasing and has eliminated the idle capacity of fabricating shops. The leading interest and some of the larger fabricating companies are now demanding from 90 days to four months on new work. Much of this, however, is due to the inability of the plate and shape mills to roll the plain material. Among the orders placed the past week is one to the McClintic-Marshall Construction Co. for three large mill buildings for the Stanley Mfg. Co., Mansfield, O., while a large tonnage of steel will be required for the Magee Memorial hospital. We quote the market as follows:

Beams and channels, 15 inches and under, zees, 1.25c; tees, 1.25c; angles, from 3 to 6 inches, 1.25c; over 6 inches, 1.35c; universal and sheared, 1.30c; over 15 inches, 1.35c; plates, 6¼ inches wide and wider, 1.35c.

Merchant Pipe. — Numerous small orders for line pipe and oil country goods have been placed during the week, but the bulk of the tonnage pending in extensive inquiries is still to be placed. From four to six miles of miscellaneous sizes for Ohio and West Virginia delivery are included in the business taken. Four miles of 4 to 10-inch for southwestern delivery were also placed. There is pending

from one buyer over 70 miles of oil country goods, while Canadian inquiries of considerable importance have not yet been closed. The Standard Oil company's inquiry for from 25 to 40 miles of steel line pipe also is among the orders pending. Jobbers, to a large extent, have specified over their contract requirements for June, taking full advantage of the 30-day protective period since the advance in prices, which period terminates July 1. The new card is in force on all new business, and will be the absolute minimum after July 1.

We quote the official discount to jobbers subject to the usual preferential discount to the larger buyers, as follows:

Iron and Steel Pipe Basing Prices.

	Steel.		Iron.	
	Butt weld.			
	Black.	Galv.	Black.	Galv.
⅛, ¼ inch.....	73	53	68	48
⅜ inch	74	64	69	53
½ inch	77	67	72	59
¾ to 1¼ inch.....	80	72	75	64
2 to 3 inches.....	81	74	76	65
	Lap weld.			
2 inches	78	71	72	63
2½ to 4 inches.....	80	73	74	66
4½ to 6 inches.....	79	71	73	65
7 to 12 inches.....	78	68	71	61
13 to 15 inches....	55	..	47	..
Extra Strong, Plain Ends.				
	Butt weld.			
⅜, ¼, ⅛ inch.....	69	59	65	55
½ inch	74	68	70	63
¾ to 1½ inch.....	78	72	74	65
2 to 3 inches.....	79	73	75	66
Extra Strong, Plain Ends.				
	Lap weld.			
2 inches	75	69	71	63
2½ to 4 inches.....	77	71	74	66
4½ to 6 inches. ...	76	70	72	65
7 to 8 inches.....	70	60	65	55
9 to 12 inches.....	65	55	60	50
Double Extra Strong, Plain Ends.				
	Butt weld.			
½ inch	64	58	60	52
¾ to 1½ inch.....	67	61	63	55
2 to 3 inches.....	69	63	65	57
Double Extra Strong, Plain Ends.				
	Lap weld.			
2 inches	65	59	61	52
2½ to 4 inches.....	67	61	63	57
4½ to 6 inches.....	66	60	62	56
7 to 8 inches.....	60	50	55	45

Plugged and reamed pipe is furnished at 2 points higher price, either butt or lap weld.

The above discounts are for full weight pipe, subject to a variation of 5 per cent, merchant pipe, when specified, being furnished up to 6 inches at one point higher discount (lower price).

Boiler Tubes.—Buying of steel boiler tubes continues very heavy and prices are firm. The leading interest is asking from seven to eight weeks on deliveries, while independent boiler tube makers are in about the same position, and are holding rigidly to the new card rate. Charcoal iron tube makers have as yet made no move towards changing prices on that product, but are holding firm to the present prices. We quote the official discount on steel and charcoal iron boiler tubes as follows:

	Steel.	Iron.
1½ inch	60	48
1¾ to 2¼ inch.....	64	50
2½ inch	66½	55
2¾ to 3¼ inch.....	71½	57½
3½ to 4½ inch.....	74	60
5 and 6 inch.....	66½	..
7 to 13 inch.....	64	..

To destination east of Mississippi river will be sold at delivered discount for carloads lowered by 2 points, for lengths 22 feet and under; longer lengths, f. o. b. Pittsburgh. Usual extras to jobbers and boiler manufacturers.

Wire Products.—Makers have generally withdrawn all tenders of new business below $1.60, Pittsburgh, on wire nails, and have declined to further extend existing contracts that were accepted originally on the $1.55 basis. Increased specifying and larger buying by consumers and by jobbers has absorbed most of the capacity of producers for some weeks ahead, and the softening tendency of prices has about disappeared. Makers east of Pittsburgh are declining new business below $1.60 for nails and $1.40 for plain wire. Some contracts have been placed during the present month covering 60 days' requirements by jobbers at $1.55, but these cannot be duplicated. Lower prices than $1.55, at which some half-yearly contracts were taken by mills earlier in the year, ranging about $1.50 on wire nails, have been cleaned up, and even the $1.55 price no longer represents the current mill tonnage.

We quote the market as follows:

Wire nails, jobbers, carload lots, $1.60; retailers' carload lots, $1.65; cut nails (western makers), jobbers' carload lots, $1.55 to $1.60, painted barb wire, jobbers' carload lots, $1.60; retailers' carload lots, $1.65 with 30c for galvanizing; plain wire to jobbers in carloads, $1.40; and to dealers, in carloads, $1.45; polished staples, $1.60; galvanized staples, $1.90.

Wire Rods.—There is some improvement in the demand for wire rods, and specifications are of larger volume with prices somewhat firmer. Wire mills are accepting larger shipments and are calling for more prompt deliveries, and new business is being negotiated for the last half. Prices are still unchanged.

We quote $25 to $26, Pittsburgh, for Bessemer and open-hearth wire rods.

Coke.—The coke market is quiet, but under the surface there is much suppressed anxiety among both buyers and sellers. The majority of contracts expire July 1, and shipments on these cease on Saturday of this week. The spot market is firmer, inquiries for spot shipment being in excess of the supply, one buyer asking for 50 cars today, having been able to obtain but 20 cars, and at the firm price of $2.25. Furnaces depending on spot coke after July 1 have, as a rule, been notified that the contract price of $2.50 will prevail on spot shipments. There has been much expectancy of rapid developments in the coke market during the next few days. Buyers and sellers are conferring more anxiously, but contracts are still unsigned. The contract market is being held by large operators at $2.50 for high grade coke, but there are reports of some tenders of business being considered at $2.25 based on a less favorable analysis of the coke. One producer and a large shipper of coke is evolving a plan to base his price on analysis entirely with the standard fixed at $2.50, ovens. The Connellsville ovens are steadily reducing production, but in such a way as not to interfere with their organization and in being enabled to increase readily should occasion demand. The Connellsville Courier reports for the week ending June 15 a total of 31,442 ovens active with a production of 391,792 tons, against 31,422 ovens active and a production of 398,656 tons for the preceding week. The decline in production for the week is about 7,000 tons, and the present week is expected to show a still further and more marked decline in tonnage. We quote standard Connellsville furnace coke for spot shipment at $2.25 and contract coke at $2.25 to $2.50, ovens. On standard Connellsville foundry coke for spot and future shipment we quote $2.50 to $2.75, ovens. The foundry coke market is much more active, and the demand is increasing.

Old Material.—There has been a much more active buying of heavy melting steel during the past week and a shortage is reported in almost all directions, while consumption is heavy and has advanced the price to a minimum of $13.50. Dealers are asking from $13.65 to $13.75, but so far have been unable to get this higher price for any large lots because the larger consumers have gone over their heads so generally in buying direct and paying the full market price. With the heavy melting steel supply short and the bulk of the tonnage remaining in the hands of dealers, the situation is believed to be rapidly reaching a point where better than $13.50 will have to be met by the large consumers. Bundled sheet scrap is a little stronger, having advanced 25 cents. Some small sales of low phosphorus are reported at $16.25, though one sale during the week was made at $16. Machine shop turnings are slightly stronger, being quoted at $10.75 to $11.25. Cast borings are held at $10 to $10.50. We quote, gross tons, delivered in the Pittsburgh district, including Monessen, Steubenville,

Brackenridge and Follansbee, as follows:

Heavy melting scrap	$13.50 to 13.75
Rerolling rails	14.00 to 14.50
Malleable	12.75 to 13.00
Bundled, sheet scrap	12.25 to 12.50
Iron axles	22.00 to 22.50
Old iron rails	15.00 to 15.50
Stove plate	9.00 to 9.50
No. 1 wrought scrap	13.50 to 14.00
Old car wheels	14.25 to 14.50
Low phosphorus	16.00 to 16.25
Machine shop turnings	10.75 to 11.25
Cast borings	10.00 to 10.50
No. 1 cast scrap	12.50 to 12.75

Annual Meeting of Mining Institute

The Lake Superior Mining Institute announces that its seventeenth annual meeting will be held Aug. 28 to 30, inclusive. The headquarters will be established at Houghton, Mich. The subject of mining methods on the various ranges in Northern Michigan which was presented at the meeting last year will be taken up more in detail at the coming session, it being the intention in time to discuss the methods of mining on all of the ranges in the Lake Superior district. The subject of universal mining laws, workmen's compensation and safety appliances also will be considered.

CHICAGO

Mills and Furnaces Swamped With Specifications

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Continued quietness in the pig iron market and an increasingly high tonnage of specifications are the principal features of interest in the west. The railroads remain an important factor in the situation and while considerable new business is being offered, principally for prompt shipment, few producers in this territory are in a position to consider it. Mills continue to run behind on deliveries, the total specifications for the month of May having already been doubled. While the total tonnage of structural contracts let during the week is small, the entire amount has been taken by independents. The market continues to be very buoyant along all lines, general conditions throughout the country being indicative of increasing business in the future.

Pig Iron.—The market has again relapsed into a state of quiet, activity being confined to scattering sales of carload lots. While most malleable foundries are well covered for immediate requirements, other lines are not as well taken care of and there is practically no buying for future requirements. Melters in general seem to be confining their purchases to immediate needs and while they are well covered for the business already booked, any increase in the latter will bring about a buying movement. Southern foundry is firm at $11.50, Birmingham, for the balance of the year. Some small inquiries for this iron are reported, including one for 300 tons from an Ottumwa, Iowa, foundry. A considerable number of sales are reported of one and two carloads. One of the largest sales consisted of 500 tons of 8 per cent silicon to a melter in adjacent territory. Northern foundry No. 2 is very strong at $14.50, with an early advance expected. This iron is quoted f. o. b. Bayview furnace by the leading interest and $15.25 delivered in Milwaukee. Deliveries to Milwaukee from Chicago furnaces can still be made at $15.00.

The following prices represent the market for Chicago delivery, for the balance of the year, except northern foundry and malleable Bessemer, which are quoted f. o. b. local furnace:

Lake Superior charcoal	$15.75
Northern foundry No. 2	14.50
Southern foundry No. 2	15.85
Southern silv'ries, 5 per cent sil.	16.35
Jackson co. silveries, 8 per cent	17.90
Malleable Bessemer	14.50
Alabama basic	15.60

Billets.—As has been the case for some time, western mills are practically a negligible factor in the market, as capacities continue to be taxed and no producers are in a position to make early deliveries. The continued scarcity of billets results in increased firmness of quotations. We quote, open-hearth forging billets, $28, Chicago and re-rolling billets, $24.50.

Merchant Bars.—While the majority of producers continue to quote bar iron at 1.25c, there is practically no new business being taken at that figure, owing to the fact that mills are taxed for sometime in advance with business already on the books. Conditions in the steel bar situation emphasize those that maintained during the previous week, soft steel bars showing increasing firmness at 1.38c, Chicago. While there is no decrease in the amount of new business that is being offered, but little of it is being taken by western mills, as specifications against contracts continue at an increasingly high rate. Shafting is very firm at 65 per cent for carloads and 60 per cent for less than carloads. The demand for material out of stock is constantly increasing and store prices show a tendency to advance.

We quote, f. o. b. Chicago, as follows:

Bar iron, 1.25c; hard steel bars, rerolled, 1.25c to 1.30c; soft steel bars, bands and small shapes, 1.38c base; hoops, 1.48c; smooth finished machinery steel, 1 inch and larger, 1.78c; shafting 65 per cent off list for carload lots, 60 per cent off for less than carloads.

On iron and steel from local stock, we quote, as follows:

Bar iron, 1.50c to 1.60c per pound base; soft steel bars, 1.60c to 1.65c per pound base; soft steel hoops, 1.80c to 1.90c, full extras.

Structural Material.—While the total tonnage taken by fabricators during the week is small, the congested condition of producing plants and firmness in quotations are maintained by continued buying on the part of the railroads. The position of the fabricators in the present market is not entirely satisfactory; despite the fact that tonnages have been taken at a little better prices, the latter are still not in harmony with quotations on plates and shapes. While a considerable number of contracts have been let, the total tonnage amounts to only 2,660 tons, all of which has been taken by independents. The Worden-Allen Co. has taken 128 tons from the Copper Range Railroad Co. for a bridge at Beacon Hill, Mich., and the Morava Construction Co. has taken 240 tons from the American Book Co. for a building at Twenty-second street and Calumet avenue, Chicago; 593 tons have been taken by the Virginia Bridge & Iron Co. for a hotel building at Shreveport, La.; the Ralston Iron Works has taken 280 tons from the Liverpool & London & Globe Insurance Co. for a building at San Francisco

and 274 tons have been taken by the Minneapolis Steel & Machinery Co. for the Minnesota National Guards' Armory building at Minneapolis. Other contracts let during the week include 202 tons by the Chicago & Northwestern Railway Co. for signal bridges; 124 tons for trusses in the Fourth Presbyterian church, Chicago, and 144 tons for the Rumely building, Chicago. The Wood Construction Co. has taken 433 tons from the Chicago Junction Railway Co. for a building at Chicago.

We quote, mill prices, f. o. b. Chicago, as follows:

Beams and channels, 15 inch and under, 1.43c. For extras, see Pittsburgh report.

Store prices are as follows:

All angles, 3 inches and larger, including 6 inches, $1.70 to $1.75 per 100 pounds; angles over 6 inches, $1.75 to $1.80 per 100 pounds, base; beams, 3 to 15 inches, inclusive, $1.70 per 100 pounds, base; channels, 3 inches and larger, $1.70 per 100 pounds, base.

Rails and Track Fastenings.—Railroad buying continues unabated and but few western mills are in a position to take new business offered. At present there is no evidence that railroad activity will be discontinued, as recent plans call for even more buying than has appeared in the market. The Canadian Northern has entered the market for 10,000 tons of open-hearth rails for early delivery. The ability of western mills to consider this order is questionable as present bookings suffice to keep them in operation for some time.

We quote, light rails, f. o. b. Chicago, and track fastenings, f. o. b. Joliet, as follows:

Light rails, carloads, 25 to 45-pound, 1.20c to 1.25c; 16 to 20-pound, 1.25c to 1.30c; 12-pound, 1.30c to 1.35c; 8-pound, 1.35c to 1.40c.

Light section relayers, 45 pounds and under, subject to inspection, $21 to $23; standard section relaying rails, subject to inspection, $23.50 to $24.

Track fastenings, f. o. b. Joliet, angle bars, 1.50c; railroad spikes, 1.55c to 1.60c, smaller size spikes, 1.65c, base; track bolts with square nuts, 1.95c to 2.05c base.

Plates.—The market is very firm at 1.43c and specifications continue very heavy. On account of the termination of many contracts on July 1, it is expected that specifications for the ensuing week will total an even greater amount. The total received during May has already been equalled and, according to expectations, will in some cases be doubled. The railroads continue to be the most important factor in the situation, as there is no falling off in car buying.

While a few producers are able to take business for October delivery, the majority can promise nothing earlier than November and in some instances even a later date is named. The Kanawha & Michigan is in the market for three passenger cars and the Metropolitan West Side Elevated Railway is in the market for 50 steel passenger cars. The Illinois Central is in the market for 50 Mikado locomotives, 20 Pacific locomotives and 16 switching locomotives.

The International Harvester Co. has entered the market with an inquiry for 100 steel tank cars.

We quote, f. o. b. Chicago, as follows:

Tank plates, ¼ inch thick, 6⅝ to 100 inches wide, 1.43c. For extras, see Pittsburgh report.

Store prices are as follows:

Tank steel, ¼ inch and heavier, up to 72 inches wide, $1.70.

Sheets.—The market for this material is very firm, the conditions of the previous week being emphasized. Specifications keep pace with those for plates and all producers in this territory are far behind on deliveries.

We quote, f. o. b. Chicago, as follows:

Blue annealed, No. 10, 2.00c; No. 12, 2.05c. Box annealed, No. 28, 2.35c. Galvanized, No. 28, 3.45c.

For mill prices, see Pittsburgh report. Freight to Chicago, 18 cents.

Wire Products.—The favorable weather conditions, coupled with encouraging crop reports received from the agricultural districts sustain the buying of wire products at an undiminished rate. In addition to the movement of agricultural wire the increasing amount of construction work throughout the country has resulted in like activity in other wire products.

We quote, f. o. b. Chicago, as follows:

Wire nails, jobbers' carload lots, $1.78; retailers' carload lots, $1.88; retailers' less than carload lots, $1.98; painted barb wire, jobbers' carload lots, $1.78; retailers' carload lots, $1.88; retailers' less than carload lots, $1.98, with 30c for galvanizing; plain wire, jobbers' carload lots, $1.58; retailers' carload lots, $1.63.

Merchant Pipe and Tubes.—Notwithstanding the recent advance there is considerable activity in the market, buying being maintained at a greater rate. Delivery continues to be the most important issue in the majority of sales and store prices are consequently very strong.

We quote, store prices on merchant pipe and tubes, as follows:

Iron and Steel Pipe Basing Prices

	Steel.		Iron.	
	Black	Galv.	Black.	Galv.
Butt.				
⅛ inch and ¼ inch.	70.2	49.2	62.2	41.2
⅜ inch	74.2	63.2	67.2	51.2
½ inch to 1½ inch.	77.2	68.2	70.2	58.2
Lap.				
2 inch	75.2	67.2	67.2	57.2
4½ inch to 6 inch..	76.2	67.2	68.2	59.2
Card Weight.				
7 inch to 12 inch....	74.2	63.2	67.2	56.2
Extra Strong Plain Ends.				
Butt.				
⅛, ¼, ⅜ inch.....	65.2	53.2	59.2	47.2
½ inch	70.2	58.2	64.2	52.2
2 inch to 3 inch....	75.2	63.2	....	....
Lap.				
2 inch	71.2	59.2	65.2	53.2
7 inch to 8 inch....	66.2	54.2	60.2	48.2
Double Extra Strong.				
Butt.				
½ inch	58.2	46.2	....	....
¾ inch to 1½ inch.	61.2	49.2	....	....
Lap.				
2 inch	59.2	47.2	....	....
4½ inch to 6 inch..	60.2	48.2	....	....
7 inch to 8 inch....	54.2	42.2	....	....

Tubes.

	Lap weld steel.	Charcoal iron.	Shelby seamless.
	Per cent.	Per cent.	Per cent.
1 inch	38	..	56½
1¼ to 2¼ inch.....	54	39	34
2¾ to 3¼ inch.....	64	49	45
3½ to 4½ inch.....	66⅔	49	45
5 to 6 inch.....	54	..	..

Cast Iron Pipe.—The market remains very firm and an advance is expected at an early date. There is a fair amount of inquiries for small tonnages and makers of pipe are well satisfied with the situation. The United States Cast Iron Pipe & Foundry Co. has taken 1,500 tons from Appleton, Wis., and Rock Island, Ill., is in the market for 2,000 tons of 6-inch pipe.

We quote, f. o. b. Chicago, as follows:

Four-inch water pipe, $27.00, 6 to 12 inches, $25.00, larger sizes, $24.50; gas pipe, $1 a ton higher.

Old Material.—The market for old material is characterized by increased weakness, which has culminated in a shading of 25 cents a ton on both Nos. 1 and 2 railroad wrought. While there is some betterment in labor conditions, the scarcity has not been greatly relieved and consequently there is less scrap buying. Railroad wrought continues to be the largest item in the railroad offerings and a further decline is expected. A list has been issued by the Chicago, Burlington & Quincy Railroad Co. for 3,220 tons, the largest items being 500 tons of No. 1 railroad wrought and 400 tons of No. 2. The list also includes 200 tons of iron couplers. The Chicago, Milwaukee & St. Paul has issued a list which includes 500 tons of steel rails and 250 tons of iron rails and a list issued by the Rock Island, totalling 1,506 tons, includes 200 tons of No. 1 steel rails, 200 tons of No. 1 railroad wrought and a like amount of No. 2.

We quote, for delivery in consumers' yards, Chicago, as follows:

Gross Tons

Old car wheels	$13.25 to 13.75
Old iron rails	16.50 to 17.00

Rerolling rails (5 ft. and over)	13.25 to 13.75
Old steel rails (3 ft. and under)	12.50 to 13.00
Frogs, switches and guards	12.00 to 12.50
Heavy melting steel	12.00 to 12.50
Shoveling steel	11.75 to 12.25

Net Tons

No. 1 R. R. wrought	$12.25 to 12.75
No. 2 R. R. wrought	11.25 to 11.75
Arch bars and transoms	15.00 to 15.50
Knuckles, couplers and springs	11.50 to 12.00
Shafting	14.50 to 15.00
Iron car axles	19.00 to 19.50
Steel car axles	15.75 to 16.25
Locomotive tires	13.50 to 14.00
Dealers forge	10.00 to 10.50
Pipe and flues	9.00 to 9.50
No. 1 cast	12.00 to 12.50
No. 1 busheling	10.25 to 10.75
No. 2 busheling	7.50 to 8.00
No. 1 boiler cut	8.25 to 8.75
Boiler punchings	12.50 to 13.00
Cast and mixed borings	6.50 to 7.00
Machine shop turnings	7.25 to 7.75
Railroad malleable	11.75 to 12.25
Agricultural malleable	10.50 to 11.00
Angle bars, splices, etc., iron	14.00 to 14.50
Angle bars, steel	11.50 to 12.00
Stove plate and light cast scrap	10.00 to 10.50

CLEVELAND

Pig Iron Quiet—Iron Bars Firm

Office of THE IRON TRADE REVIEW,
Penton Bldg., June 25.

Iron Ore.—A large Pittsburgh steel interest which contemplates the erection of two blast furnaces is now negotiating for its ore requirements for next year. It is probable that this will involve about 600,000 tons, but in view of the fact that the furnaces will not be blown in before the summer of next year no shipments probably will be made until the opening of the 1913 navigation season. A scarcity of cars has developed in the Lake Superior district for hauling ore from the mines to the docks and cars are being diverted from the Arizona copper regions to relieve the congestion temporarily. At upper lake ports ore carriers are not making the dispatch essential for a record-breaking season, being held at the docks much longer than necessary to receive their cargoes. Ore transactions are limited in number and involve small lots only to fill out purchases made earlier in the year.

On base ores with the guarantee of 55 per cent on old range and Mesabi Bessemer, and 51½ per cent on old range and Mesabi non-Bessemer, we quote as follows: Old range Bessemer, $3.75; Mesabi Bessemer, $3.50; old range non-Bessemer, $3.05; Mesabi non-Bessemer, $2.85.

Pig Iron.—The local pig iron market has been rather quiet the past few days, although it is generally believed that the demand will improve considerably the first of next month. Prices have remained firm. The Aultman-Taylor Co., Mansfield, O., which was in the market for 500 tons of No. 2 and a like amount of No. 3 for last half, had little trouble in filling the order at $13.25, valley, the contract going to valley furnaces. Corrigan, McKinney & Co. blew in their second stack June 17, after a year's wait, and are operating on basic. No new inquiries have been received within the last week and the volume of business has not been what it was a few weeks ago. We quote, delivered in Cleveland, as follows:

No. 1 foundry	$14.25
No. 2 foundry	13.75
No. 2 southern	15.35
Gray forge	13.25
Bessemer	15.15
Lake Superior charcoal	15.75
Jackson co. 8 per cent silvery	16.00

Coke.—There has not been sufficient activity in coke buying here the past week to indicate on what basis the future price of contract coke is going to be established. Furnacemen do not seem especially anxious at present to buy for future requirements, most of them covering only for immediate requirements. Because of the fact that nearly all of the local buyers are well provided for foundry coke, there has not been much activity in this grade, although one agent reports the sale of 40 cars of Wise county Virginia coke for last half delivery, at $2.50, ovens. We quote as follows:

Connellsville furnace coke, $2.00 to $2.15 for prompt delivery, and $2.25 to $2.50 on contract; Connellsville foundry coke, $2.50 to $2.75 for prompt, and $2.50 to $2.75 on contract.

Finished Material.—The local iron mills have a heavier tonnage booked than at any time in the past four years and the market for iron bars is now firmly established on a basis of 1.35c. Warehouse shipments of all steel products are heavier than usual and on carload orders warehouse prices are being obtained. This reflects the difficulty that is being experienced by all consumers of finished materials in obtaining prompt deliveries from the mills. Although new tonnage is comparatively light, practically no material remains unspecified on contracts terminating July 1. The preference of open-hearth steel over Bessemer has resulted in an acute scarcity of the former and an advance in all open-hearth products is anticipated. Higher quotations, particularly on soft steel bars, hoops, bands and plates may be made in the near future.

Old Material.—The Cleveland iron and steel scrap market has been characterized by a period of inactivity extending over a week, although neither dealer nor seller is complaining. Dealers have fallen behind in deliveries, due to a shortage of common labor, and hope to catch up if the market remains quiet a week or so longer. Prices have not changed since the latter part of last week, when country mixed steel advanced. Heavy melting steel and busheling are unchanged. One of the local steel plants is in the market for a large tonnage of heavy melting steel, but it is not believed the contract will be placed until after July 1. There continues to be a good demand for machine shop turnings and drillings, and borings are selling well. No railroad lists are now before the scrap dealers. We quote, f. o. b. Cleveland, as follows:

Gross Tons.

Old iron rails	$15.00 to 15.50
Old steel rails (under 6 ft.)	13.00 to 13.50
Old steel rails (over 6 ft.)	13.50 to 14.00
Relaying rails	19.50 to 20.00
Old car wheels	13.00 to 13.50
Old steel boiler plate	10.50 to 11.00
Malleable iron (railroad)	12.50 to 13.00
Steel axles	18.00 to 18.50
Axle turnings	10.00 to 10.50
Malleable iron (agricultural)	10.00 to 10.50
Heavy steel	12.25 to 12.75
Country mixed steel	11.00 to 11.25
Bundled sheet scrap	10.00 to 10.50

Net Tons.

No. 1 R. R. wrought	$12.00 to 12.50
No. 1 busheling	10.50 to 11.00
No. 1 machine cast	11.00 to 11.50
No. 1 dealers' wrought	10.00 to 10.50
Machine shop turnings	7.75 to 8.00
Pipes and flues	9.50 to 10.00
Wrought drillings	7.75 to 8.00
Stove plate	9.50 to 10.00
Cast borings	7.75 to 8.00
Wrought iron piling plate	14.50 to 15.00
Wrought iron arch bars	14.00 to 14.50

The last of 500 all-steel, drop-bottom gondolas was turned out at the Roanoke, Va., shops of the Norfolk & Western a few days ago and was at once sent to the West Virginia coal fields to be put into service. This order was begun April 15. An order for 500 all-steel hoppers has been placed with the Roanoke shops and will be filled as rapidly as possible, the cars being put into service as completed.

PHILADELPHIA

Further Premiums Feature Eastern Market

Office of THE IRON TRADE REVIEW, Philadelphia, June 25.

Eastern mills are being called upon more urgently in some lines to fill the demand for prompt shipment of material and are profiting by the willingness of some buyers to pay premiums for early delivery. In plates a lot of 3,500 tons was taken this week for immediate specification at 1.30c, Pittsburgh. Plate specifications with eastern mills are very heavy and in other lines they are also exceedingly liberal. New business is fair, but not so heavy. Mill activities continue on a broad scale. Pig iron is quiet except for the strong demand for pipe iron. Old material is moving slowly.

Pig Iron.—Cast iron pipe makers along the Delaware river are enjoying the heaviest melt in several years, and this condition is being shown by the continued liberal purchases and inquiries for iron being put forth by these consumers. One plant in the week took 1,500 tons of Virginia, lower grades, for early delivery, at full furnace prices equivalent to about $15, delivered, and a little less than 1,000 tons of northern iron at $14.90, delivered. Several of the pipe makers of this district are now negotiating for from 10,000 to 12,000 tons for nearby and third quarter shipment. Northern pipe iron is quotable from $14.75 to $15, delivered. Southern makers are supplying little of the current demand as lower silicon iron is scarce with them. A Virginia pipe maker has also bought 3,000 tons of No. 3 at $12.50 and 3,000 tons of forge at $12.25, Virginia furnace, for third quarter. Excepting the pipe trade, the Philadelphia iron market is quiet. Prices show considerable strength at the levels of $15.25 to $15.50, delivered Philadelphia for No. 2X. With some sales going at $15.75, delivered, new inquiry is light. An eastern Pennsylvania steel maker has purchased 2,000 tons of eastern basic for early shipment at $15.25, delivered. There remain some desultory negotiations in this grade for forward delivery. A local malleable consumer has closed for about 1,000 tons for last half at $15.75, delivered, and another buyer is still out for 1,000 to 2,000 tons of the same grade. There has been small selling of standard low phosphorus iron at full prices. In furnace operations the Emaus stack of the Reading Iron Co. is about to go out. One of the Central furnaces at Harrisburg is blowing in. The Alan Wood Iron & Steel Co. is about to blow out its smaller furnace for repairs and will blow in a larger stack.

We quote for prompt and third quarter delivery at consumers' plants in Philadelphia and vicinity, as follows:

Eastern Pa. No. 1X foundry	$15.50 to 15.75
Eastern Pa. No. 2X foundry	15.25 to 15.50
Eastern Pa. No. 2 plain	15.00 to 15.25
Standard gray forge	14.50 to 14.75
Basic (Eastern and Central Pa.)	15.25
Virginia No. 2X	15.80 to 16.05
Southern No. 2	15.00 to 15.25
Standard low phosphorus	19.50 to 20.00

Coke.—Eastern furnaces continue to hold to their policy of buying 48-hour coke only for prompt shipment, which they have been doing around $2, ovens, or less. The deadlock on the last half contracts still holds strongly. There are some reports which lack substantiation of Connellsville last half coke being offered at new low prices. It is expected that the real test of strength of the coke situation will come in the next two weeks.

Finished Material.—Heavy specifications are uniform with eastern steel makers and as the pressure for deliveries becomes stronger, further premium business is developing. There are some notable exceptions to the lighter volume of strictly new business current. A leading plate mill reports itself as being fairly swamped with orders for rolling and it has recently been booking at a rate more than twice its capacity. Some eastern structural shape makers are filled up from four to six weeks. Pittsburgh and middle western mills are not promising plates, shapes and bars to this territory under 30 to 60 days.

Mill operations in the east continue very active. Open-hearth steel plants generally are being worked as near to capacity as possible, the restraint coming from the insufficient labor supply in steel works and rolling mills. Complaint as to the scarcity of men is general. The Pennsylvania Steel Co. resumed duplexing at its Steelton steel plant last week.

One eastern buyer in the week paid 1.30c to an eastern mill for a lot of 3,500 tons of plates for prompt delivery and immediately specified against the order. Another eastern consumer having been disappointed in obtaining deliveries on a quantity of plates given some weeks ago to a Pittsburgh mill, has cancelled the order and replaced it at a higher price with an eastern Pennsylvania manufacturer. Eastern plates are quotable at from 1.25c to 1.30c, Pittsburg, or 1.40c to 1.45c, Philadelphia. Shapes are somewhat behind plates in strength, though small sales for immediate shipment are being done at 1.30c, Pittsburgh. One mill is quoting 1.35c on special shapes. Fabricated prices still show some prices around $40, erected, reflecting low-priced shape contracts, many of which will expire July 1. Small lots of steel bars have sold at 1.25c, Pittsburgh. Bar iron is now holding around 1.30c, Philadelphia. Sheet buyers, after having held off a while, are now renewing contracts from July 1 at higher prices. Billets are strong though there is some report of weakness in axle billets.

The railroads are furnishing some good-sized inquiries and orders. The Pennsylvania lines are in the market for the material for about 1,000 freight cars, including 875 refrigerator cars and some locomotives which it will build at Altoona. The Reading has plans out to close July 5 on several blocks of additional elevated trackage and street bridges to require 3,000 to 5,000 tons. The Pennsylvania railroad has begun important improvements at its North Philadelphia station. A decision is still awaited on the C. & O. pier at Newport News. Wells Bros. have the general contract for the Title Guarantee & Trust Co. building, Baltimore, 300 tons.

We quote, delivered to consumers' plants in Philadelphia and vicinity, as follows:

Plain structural shapes, 1.35c to 1.45c; tank plates, 1.40c to 1.45c; steel bars, 1.35c; common bar iron, 1.30c; cut nails, 1.65c to 1.70c; blue annealed sheets, No. 10 gage 1.55c to 1.60c; 4 x 4-inch open-hearth rolling billets, $23.40 to $24.40; forging billets, $28.40. Extras shown under Pittsburgh report. Phila-

delphia warehouse prices 1.75c for plates, shapes and bars.

Ship Building Work.—The government is taking bids from eastern yards for eight all-steel coal barges, which will require 3,000 to 4,000 tons of shapes and plates. Requests for bids upon another freight boat to require about 2,000 tons, came out this week. Final action is about to be taken in the award of two large freight steamers which have been before eastern builders for several weeks.

Old Material.—With the annual shutdown period in sight for a number of the mills, buying of old material is following very conservative lines. There has been some buying of borings and turnings by the smaller consumers subsequent to the purchase of some round tonnage lots by large plants, as reported, and prices have advanced in these grades. The leading consumers of car wheels have supplied their needs and this material is off 25 cents. The steel works are not active in the market and are holding their interest to such lots as they can pick up at bargains. We quote gross tons, delivered at consumers' plants in eastern Pennsylvania and western New Jersey, as follows:

Old iron rails	$16.50 to 17.00
Old steel rails (rerolling)	14.75 to 15.25
No. 1 heavy melting steel	13.50 to 13.75
Old car wheels	13.75 to 14.25
Old iron axles	23.00 to 24.00
Old steel axles	17.50 to 18.00
No. 1 railroad wrought	15.50 to 16.00
Wrought pipe	12 50 to 13.00
Cast borings	9.75 to 10.25
Machine shop turnings	10.75 to 11.25
Heavy cast	13.50 to 14.00
Malleable	11.75 to 12.25
Stove plate	10.50 to 11.00
No. 1 forge	12.00 to 12.50

Freight rates per ton on scrap from Philadelphia to principal eastern consuming points are: $0.60 to Ivy Rock, Pa.; $0.65 to Phoenixville, Pa.; $0.80 to Coatesville, Pa.; $0.85 to Bethlehem, Pa., Reading, Pa., and Roebling, N. J.; $1.10 to Pottsville, Pa., Lebanon, Pa., and Columbia, Pa.; $1.20 to Harrisburg and Steelton, Pa.; $1.40 to Milton, Pa.

CINCINNATI

Prices Firm Due to Scarcity of Iron

Office of THE IRON TRADE REVIEW,
503 Mercantile Library Bldg., June 25.

Pig Iron.—The local pig iron market continues quiet and without important developments. Prices have not been tested to any extent, but remain firm and unchanged owing to the increasing scarcity of iron. A large tonnage is being shipped on contracts, and in one or two instances furnaces are slightly behind in deliveries. Consumers in this territory not covered by contracts are cautious in their purchases. Many melters in this district who usually contract through the last half at this season, are inquiring for only the third quarter. This indicates that buyers are uncertain as to the future, but it also can be attributed to the fact that the actual operating capacity of the foundries in this territory at present is only about 50 per cent of capacity. It is predicted that the price of southern iron will advance. The declining stocks in furnace yards and the gradual withdrawal of certain grades from the market, all point to a shortage of pig iron. Southern Ohio furnaces are asking $13.50, Ironton, for No. 2 foundry. Occasionally sales are reported at $13 or $13.25, Ironton, for No. 2, but the furnaces claim that they are on old quotations, that is, these prices were made to the buyers before the present quotations prevailed. Southern iron is stronger because the supply is limited, and while $11, Birmingham, can still be done, it is probable that this price soon will be withdrawn. Quotations for the third and fourth quarters are general at from $11 and $11.25 to $11.50, Birmingham, respectively. Inquiries are limited to car load lots. Inquiries have been received for 300 tons of No. 2 southern and 600 tons of special analysis southern iron, the latter to be shipped into Tennessee. There is also an inquiry for 1,200 tons of low phosphorus iron to be shipped into Michigan territory. With freight rates $1.20 from Ironton, and $3.25 from Birmingham, we quote Cincinnati prices as follows:

Southern foundry No. 2	$14.25 to 14.50
Southern foundry No. 3	13.75 to 14.00
Southern foundry No. 4	13.50 to 13.75
Southern gray forge	13.00 to 13.25
Mottled	12.25 to 12.50
Southern No. 1 soft	14.75 to 15.00
Southern No. 2 soft	14.25 to 14.50
Standard southern car wheel	25.25 to 25.50
Northern No. 2 foundry	14.45 to 14.70
Northern No. 3 foundry	13.95 to 14.20
Northern No. 4 foundry	13.70 to 13.95
Jackson co. 8 per cent silicon	16.95 to 17.20

Coke.—The coke market is quiet and prices are practically unchanged. Most of the foundries in this territory have contracted for their requirements for the next six months. Blast furnace operators refuse to pay prevailing quotations on furnace coke, but the producers will not make concessions, claiming that they will put out their ovens before they lower their quotations. Inquiry has been made for from 75,000 to 10,000 tons of furnace coke, but nothing can be done until the buyers and sellers reach an agreement. Furnace and foundry coke are quoted as follows in the leading producing districts:

		Prompt shipment.	Contract second half.
Connellsville district:			
Foundry	coke	$2.25 to 2.50	$2.50 to 2.75
Furnace	coke	2.15 to 2.25	2.25 to 2.50
Wise county district:			
Foundry	coke	$2.35 to 2.50	$2.50 to 2.75
Furnace	coke	2.15 to 2.25	*Sliding [scale basis
Pocahontas district:			
Foundry	coke	$2.00 to 2.25	$2.50 to 2.90
Furnace	coke	1.75 to 2.00	1.85 to 2.25
New river:			
Foundry	coke	$2.50 to 3.00	$3.00 to 3.25
Furnace	coke	2.15 to 2.25	2.35 to 2.50

*Sliding scale basis means $1.60 for coke based on $9, Birmingham, for pig iron, with an advance of 16 2-3 per cent of the amount over $9 which pig iron is quoted. This is the usual basis. Other forms of sliding contracts are also made.

Finished Material. — Announcement has been made of an advance of $1 a ton on plates and steel bars by the leading interest and it is expected that other advances will soon follow. Sheets are firm and a local mill reports that it has been compelled to refuse a large order on account of the extensive tonnage already booked. Warehouse business continues heavy in all lines. We quote, warehouse prices, f. o. b. Cincinnati, as follows:

Steel bars, 1.65c base; iron bars, 1.60c base; structurals, 1.75c base; plates, ¼ inch and over, 1.75c base; sheets, blue annealed No. 10, 1.95c base; rivets, cone head, 2.30c base; cold rolled shafting, 60 per cent discount; boiler tubes as follows: 1¼ to 2¼ inch, 60 per cent discount; 2½ inch, 62 per cent discount; 2¾ to 3¼ inch, 65 per cent discount; 3½ to 4½ inch, 67 per cent discount; and 5 to 6 inch, 60 per cent discount; soft steel cold twisted concrete bars, 60 per cent discount; soft steel cold twisted concrete bars, cut to length as follows: ¾ inch square and larger, 1.75c; ⅝ inch square and larger, 1.85c; ½ inch square and larger, 1.95c; 5-16 to ⅜ inch square and larger, 2.15c; ¼ inch square and larger, 2.25c.

Old Material. — The scrap market continues weak owing to the fact that consumers are carrying large stocks and recent transactions have not been

sufficient to warrant advances in quotations. Prices dealers will pay in Cincinnati and vicinity, are as follows:

Gross Tons

Old iron rails	$12.65 to 13.25
Old steel rerolling	11.00 to 11.50
Old iron axles	18.50 to 19.00
Heavy melting scrap	10.00 to 10.50
Relaying rails	20.00 to 21.00
Bundled sheet scrap	8.50 to 9.25

Net Tons.

Old No. 1 R. R. wrought	$10.25 to 10.75
No. 1 machinery cast	10.25 to 11.00
No. 1 busheling	8.50 to 9.25
Stove plate	7.00 to 8.00
Machine shop turnings	6.50 to 7.00
Cast borings	6.25 to 6.75
Heavy turnings	7.00 to 7.50
Mixed cast	8.00 to 9.00
Malleable	8.50 to 9.00

The M., K. & T. shops at Parsons, Kans., have been closed, throwing more than 1,000 men out of work. It is not known how long the shops will remain idle. It is reported, however, that they will be re-opened in about a month.

NEW YORK

Buying Lighter But Specifications Heavy

Office of THE IRON TRADE REVIEW, 1115 West Street Bldg., June 25.

Iron Ore.—Eastern iron mines have been considerably crippled by the scarcity of labor and full outputs are not being obtained. One mine, the Hibernia, at Wharton, N. J., has been obliged to shut down except on prospecting work. In the Port Henry district the shortages of men range from 15 to 20 per cent. There continues some scattered buying of iron ore in the east, local and foreign, in small lots. One leading foreign grade has again been withdrawn from the market because of heavy demand for this material abroad.

Pig Iron.—New inquiry for iron in the metropolitan and sourrounding districts has dropped away in the week and barring one or two fair-sized negotiations, the business is confined to comparatively small quantities. Some fair buying has been done against inquiries which have been pending for a week or two. The New York Air Brake Co. has closed for 6,000 tons of Nos. 1, 2 and 3 foundry and 1,000 tons of malleable for forward shipment, dividing the order between western Pennsylvania and Buffalo furnaces. The Delaware, Lackawanna & Western railroad has closed for 1,750 tons of Nos. 1 and 2 plain for last half delivery at Scranton, taking the business at a furnace price at Buffalo and is understood to have shaded $14. There is no evidence of weakness in the Buffalo situation, however, and $14 is reasonably firm as the forward market. Sales of about 1,000 tons of No. 2X to New England consumers at this furnace price or $16.45, delivered, are noted. Some Buffalo iron has been sold to this district for water shipment at better than $14.25, furnace, for No. 2X. A New Jersey buyer has closed for about 1,000 tons of No. 2 grades for last half. Pending inquiries from that territory include 1,000 to 2,000 tons of No. 2 plain for last quarter, 500 tons of No. 2X for last half and 600 tons of malleable for last half. A nearby consumer has closed for 2,500 tons of No. 2 southern for last half at around $11, Birmingham, and is in the market for 2,000 to 3,000 tons of northern No. 2X for last half. The inquiry of a Connecticut consumer for 5,000 tons of No. 2X for last half is still pending. One lot of 500 tons of foundry iron for export to England is out. Several Lehigh and Schuylkill valley furnaces continue to quote around $15 at the furnace for No. 2X and sales of about 1,000 tons of the former grade at this price, or $15.70, tidewater, are noted. On some brands, in these and other eastern Pennsylvania districts, these prices are being shaded up to 50 cents a ton. Some central Pennsylvania furnaces are advancing prices to $14, furnace, for No. 2X, but some quotations from that district were recently made at $13.50. The Saxton furnace, at Saxton, Pa., will blow in about July 1, and the Everett stack will go out shortly thereafter. The leading cast iron pipe interest closed with eastern furnaces in the week for 3,000 to 4,000 tons additional of lower silicon iron for delivery to its plant on the Delaware river.

We quote, delivered at tidewater for prompt and third quarter shipment, as follows:

Northern foundry No. 1	$15.50 to 16.00
No. 2X foundry	15.25 to 15.75
No. 2 plain	14.75 to 15.00
No. 2 Virginia	15.80 to 16.05
No. 2 southern foundry	15.00 to 15.25
Malleable	15.50 to 15.75
Gray forge	14.50 to 14.75

Ferro-Alloys.—Only light inquiry for forward ferro-manganese is now current and prompt material is also not so active at premium prices. Material is coming in more freely and at the present time about 7,000 tons is afloat. Some additional carloads for prompt shipment were sold this week for $50, seaboard, but in some cases quotations at this level failed to take the business. An eastern steel maker has taken 300 to 500 tons of spiegeleisen, upon which quotations ranged from $28.50 to $29, seaboard, although it is reported that lower than these prices could be done on large lots. Small sales of silico-spiegel at about $45, seaboard, are reported. Prices on 50 per cent ferro-silicon are strong and range from $70 to $73, Pittsburgh. We quote standard English ferro-manganese at $48.50, seaboard, on contracts, and at $50, seaboard, for prompt delivery, and 50 per cent ferro-silicon at from $70 to $73, Pittsburgh.

Cast Iron Pipe.—Eastern pipe shops are operating on a very heavy scale, but full production is being interfered with at some plants by labor shortages. There is more disposition on the part of some interests to advance prices. It is predicted that higher levels will soon prevail. One maker continues to advance its schedules on smaller sizes. Private interests continue to buy freely, though there are no public lettings of note except that of Washington, D. C., 2,745 tons, which goes in this week. We quote 6-inch pipe at from $21 to $22, f. o. b. New York, in carload lots, with some makers asking up to $23.

Finished Material.—The pressure for deliveries upon the mills appears to be increasing as specifications are very heavy, notwithstanding a lighter volume of absolutely new business. In structural material especially, New York fabricating shops are ordering actively against the heavy volume of work placed over the winter and spring and rolling schedules have be-

come quite congested. As a typical case, one eastern mill can make deliveries on only a few sizes of beams in two weeks and on any range of sizes of shapes it requires from four to eight weeks. In billets some eastern makers are so heavily booked that they can promise no shipments of size under two months. Plate deliveries are also lengthening. Some leading makers of steel bars are having difficulty to ship under 60 days.

Under the conditions of heavy specifications and full rolling schedules, prices are naturally exhibiting much strength. A considerable amount of shape business for early delivery is being taken by eastern mills at 1.30c, Pittsburgh, and plates are also bringing this price in larger lots. There is general expectation that an official advance of $1 a ton to 1.30c, Pittsburgh, for plates and shapes and to 1.25c on steel bars is near at hand. Some sales of Bessemer steel bars have been made for fourth quarter at 1.25c, Pittsburgh. A. E. Norton & Co. are understood to have submitted the low bid on the Adams Express Co. building, this city, but no award has yet been made. This fabricator has been figuring on the work in conjunction with the Pennsylvania Steel Co. The steel requirements on the building will be about 13,500 tons, including 4,000 tons of plates. Levering & Gerrigues have the 2,500 tons for a Park & Tilford warehouse, West 42nd street, and 250 tons for a building for the Golet Realty Co., 47th street; the National Bridge Co. has 400 tons for a station and office building for the Long Island Railroad at Jamaica, L. I.; the New England Structural Co., 400 tons for a National Fireproofing building, Boston; the Bethlehem Steel Co., as previously reported, has 600 tons for the Scribner building at 597 Fifth avenue, and 250 tons for a clinker storage building for the Alpha Portland Cement Co., at Alsen, N. Y., has gone to an independent shop. The Passaic Structural Steel Co. has taken 700 tons for the Medford Realty Co. loft, Thirty-sixth street and Fifth avenue. Revised plans are out for the Boston City Hall, originally estimated at about 2,000 tons. A loft candy factory on Broome street, this city, will require 500 tons. Bids were taken this week on a 1,000 ton highway bridge for Boston, but no award has been announced.

Railroad work is made up of small tonnages. The Central Railroad of New Jersey has placed two bridges with the Phoenix Iron Works and one with the Hedden Iron Construction Co., requiring 600 to 700 tons. The Belmont Iron Works has 200 tons for a freight station for the Pennsylvania Railroad at York, Pa. The Northeastern Construction Co. has taken the general contract for the improvements to the Manhattan terminal of Brooklyn bridge to require about 1,400 tons. Bids are in for 500 tons of grade crossing work for the Pennsylvania railroad and 400 tons for three bridges for the Maine Central upon which there are no decisions. The American Car & Foundry Co. has been inquiring of eastern mills for about 10,000 tons of plain material covering requirements of orders recently taken in the east, including 500 gondolas for the Central Railroad of New Jersey.

Bids went in this week on 1,000 tons for the Levitt Realty Co. office building, on Forty-seventh street. We quote, delivered at New York tidewater, as follows:

Plain structural shapes, 1.41c to 1.46c; tank plates, 1.41c to 1.46c; steel bars, 1.36c; common iron bars, 1.30c to 1.35c; steel bars from store, 1.80c; plates and shapes from store, 1.90c; extras as shown under Pittsburgh report.

Rails and Track Material. — The Canadian Northern is inquiring for 10,000 tons of open-hearth rails for prompt delivery. No announcement of the award against the Canadian Pacific's inquiry for 10,000 to 15,000 tons of open-hearth rails has been made. Chicago mills are so filled with open-hearth business for a number of months ahead, that it is practically impossible for them to accept any early delivery business. Standard spikes show more strength and further sales from prompt shipment have been made at 1.50c, Pittsburgh.

Old Material.—The market seems to be in a waiting attitude. None of the large eastern steel buyers have been in the market the past week and with the annual shutdowns in sight, the iron mills are taking on little material. Cast scrap is also quiet. With some exceptions, prices are no weaker, but the absence of buying makes some of them a little indefinite. In stove plate, sales have been made 50 cents lower. We quote, gross tons, prices New York dealers will pay at tidewater, as follows:

Old car wheels	$11.25 to 11.75
Old iron axles	20.00 to 21.00
Steel axles	15.00 to 15.50
Old steel shafting	14.00 to 14.25
No. 1 heavy melting steel	11.00 to 11.25
No. 1 R. R. wrought	13.25 to 13.50
Wrought pipe	9.75 to 10.00
Cast borings	7.25 to 7.50
Machine shop turnings	8.25 to 8.50
Heavy cast	11.00 to 11.50
R. R. malleable	9.50 to 10.00
Stove plate	8.00 to 8.50
Grate bars	7.25 to 7.75

Freight rates on scrap per ton to Steelton, Pa., Columbia, Pa., Pottsville, Pa., and Harrisburg, Pa., are $1.50 from Jersey City and $2.00 from New York; to Coatesville, Pa., Ivy Rock, Pa., Phoenixville, Pa., and Reading, Pa., $1.50 from Jersey City and $1.80 from New York; to Bethlehem, Pa., $1.10 from Jersey City and $1.60 from New York; to Roebling, N. J.; $1.00 from Jersey City and $1.50 from New York; to Milton, Pa., $1.60 from Jersey City, and $2.00 from New York; to Jersey City, $1.00 from New York; to Newark $1.10 from New York.

ST. LOUIS

Southern Iron Firm at $11.25 to $11.50

Office of THE IRON TRADE REVIEW,
St. Louis, June 25.

Pig Iron.—Inquiries for a total of about 2,000 tons of pig iron are in the St. Louis market, including one for 500 tons of southern No. 2, for last half delivery. Southern iron is firm at $11.25 to $11.50, Birmingham, for No. 2, all quotations of $11 having been withdrawn. Sales totaling 1,000 tons, in 100 and 200-ton lots have been reported. Northern iron is firm at $13.50, Ironton, with very little inquiry, and practically no sale. Our tabulated prices on Southern iron, delivered, to which the Birmingham freight of $3.75 has been added, follow:

Southern	No. 1	$15.50 to 16.00
Southern	No. 2	15.00 to 15.60
Southern	No. 3	14.50 to 15.00
Southern	No. 4	14.00 to 14.50

Coke.—The market for coke is dull, so far as transactions are concerned, and prices are unchanged as follows:

We quote 72-hour Connellsville foundry grades, $2.50 for immediate shipment or delivery through the year; 48-hour Connellsville furnace, $2.25; best 72-hour Virginia foundry, $2.50 to $2.75; 48-hour Virginia furnace, $2.25 to $2.40. The freight to East St. Louis and St. Louis is $2.80, and $2.70 from the Virginia fields when shipment is destined beyond St. Louis.

Finished Material.—The demand for steel bars continues good at 1.20c, Pittsburgh. Very little new business is being secured, but specifications on contracts are heavy. Steel plates and structural material continue active at 1.25c Pittsburgh, with increased demand.

Old Material. — Transactions have dropped to the minimum in scrap iron, with prices unchanged as follows:

Gross Tons

Old car wheels	$13.50 to 14.25
Old iron rails	15.25 to 15.50

Re-rolling rails (5 ft. and over)	13.25 to 13.75
Old steel rails (3 ft. and under)	12.25 to 13.25
Light section relayers (45 lb. and under) subject to inspec.	21.50 to 22.50
Re-laying rails, subject to inspec.	22.50 to 23.25
Frogs, switches and guards	10.50 to 11.25
Heavy melting steel	11.50 to 12.25
Shoveling steel	10.75 to 11.25

Net Tons

No. 1 railroad wrought	$11.50 to 12.00
No. 2 railroad wrought	10.50 to 11.00
Arch bars and transoms	14.25 to 14.50
Knuckles, couplers and springs	13.50 to 11.00
Shafting	14.00 to 14.50
Iron car axles	18.50 to 19.00
Steel car axles	16.00 to 16.50
Locomotive tires	11.50 to 12.00
No. 1 country wrought	9.25 to 9.75
Pipe and flues	8.50 to 9.00
Tank iron and cut boilers	7.50 to 8.00
No. 1 cut busheling	9.25 to 9.75
No. 2 cut busheling	6.25 to 6.75
Cast and mixed borings	6.25 to 6.50
Machine shop turnings	7.00 to 7.25
Railroad malleable	10.50 to 11.00
Agricultural, malleable	9.50 to 10.00
Stove plates	9.50 to 10.00
Angle splice bars (iron)	11.25 to 12.00
Angle splice bars (steel)	9.50 to 10.00

BRITISH MARKET

Iron and Steel Hunger is Insatiable

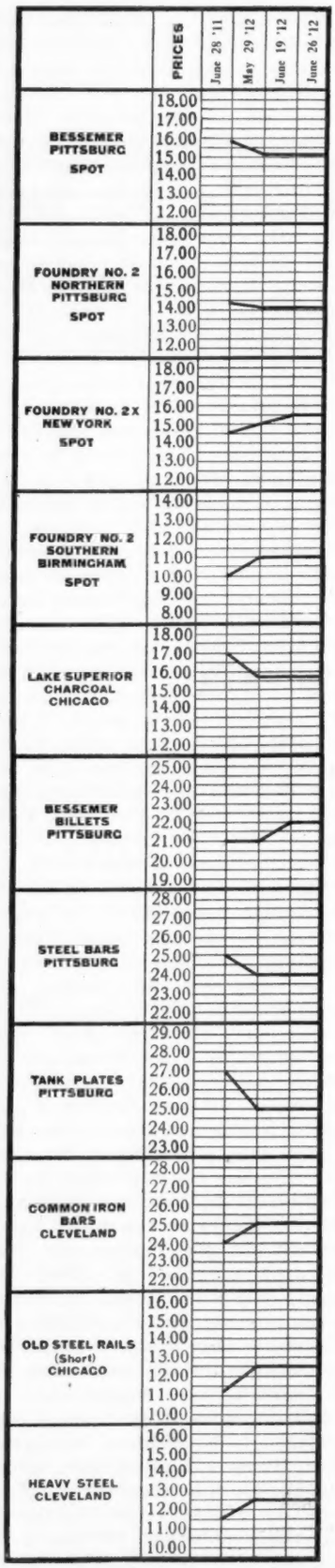
Office of THE IRON TRADE REVIEW,
Prince's Chambers, Corporation St.,
Birmingham, Eng., June 15.

Pig Iron.—After some slight fluctuations, the pig iron market remains substantially where it was a week ago. In the Middlesbrough district it is slightly stronger, and Sheffield buyers have to pay a shilling more for Lincolnshire and Derbyshire irons. The position was slightly different at Birmingham. As a rule, consumers in all districts decline to look at long contracts, partly because they have no faith in the continuance of the present high rates; but also because, in many cases, they have still contracts running about 10s below the prices now quoted, and of which it is practically impossible to secure delivery. None of the furnaces are making stocks, every ounce of iron being delivered, and generally in small lots, to meet urgent needs. In the Middlesbrough district, there are 81 furnaces in operation, compared with 78 before the coal strike. Yet the pig iron stocks are still being reduced, although not as rapidly as they were. The decrease in Connall's stores, so far this month, is 10,000 tons, making 180,000 tons below the amount stored before the strike. From the maximum, there has been a reduction of 270,000 tons. Pig iron generally is supported by the abnormal dearness of coke. On the whole, consumers are not buying at all parallel to their regular consumption. Today's price for Cleveland warrants is 53s 11d ($13.30) with 54s 9d ($13.40) three months. There is every probability of improved coke supplies shortly. A peculiar feature of the hematite trade is a strong demand from Russia, although pig iron exported there has to pay a duty of £3 per ton. Latterly, the Russian demand has been such that a portion of this duty has been remitted, in the interests of the Russian trade.

Finished Iron and Steel.—The activity in all departments of the steel trade is surpassing all records, but in iron there is at least one weak place, namely galvanized sheets. Otherwise, the demand is as pressing as ever. In all parts of the country, works are operating under severe pressure, owing to the very heavy demand for all kinds of steel. Many works are operating until late on Saturday night to cope with the demand, but deliveries are all in arrears. Yet, fresh orders are continually being placed, some establishments being booked well into next year. The most pressing demand is for billets, for which there is keen competition. For high qualities, the demand is exceptional, and in Sheffield as much as £8 has been paid for Bessemer acid quality. The market has been hardened by further increases in Germany and Belgium, and the Continent has ceased to be a serious competitor. British makers now have no difficulty in getting £6 for Bessemer billets and bars, and half a crown to five shillings more for Siemens metal. The cablegram from The Iron Trade Review announcing the shipment of American billets and plates was, on Thursday, the subject of a good deal of comment among Birmingham users, who would be very glad to see substantial shipments. They are not sanguine enough, however, to expect large supplies, especially as local importers have quite recently tested the American market, and found business in billets practically impossible, because of high freights. British buyers are more concerned to get deliveries than to haggle over prices. But as the steel works are steadily improving their deliveries, users are hoping that there may soon be better supplies, and more moderate prices. The busiest department of all is that of railway steel.

The Marquette Machinery Co., Chicago, has increased the number of its directors from three to five.

PRICE CHART



BIRMINGHAM

Some Big Producers Are Out of Market

Office of THE IRON TRADE REVIEW, Birmingham, June 25.

Pig Iron.—Business of the past week was transacted largely by two producing interests, owing to the several views in the matter of price and deliveries. Specific information is furnished on the sale of an aggregate of 3,000 tons of No. 2 foundry for shipment in the last quarter at $11.50 per ton, Birmingham. Aside from this, several lots of 500 to 750 tons each, for third quarter shipment, were sold at $11.50 per ton for No. 2 foundry, with carload quantities of the same grade reported sold at $11.75 to $12 per ton. A differential of 25 cents per ton in the prices asked for the low grades has been adopted by those producers who solicit orders, and no offerings are being made at a lower base price than $11.50 for No. 2 foundry at Birmingham. Two of the leading producers are still understood as out of the market for the present. Of the inquiry now pending, the largest involve lots of 600 to 800 tons. The aggregate of such requirement, which is in definite form, runs well into round figures, with third quarter delivery wanted in the majority of cases. Certain of the producers are quoting a basis of $12 on the business just referred to, although a basis of $11.50 is considered the market, except for certain grades that are oversold. As a whole, the schedule of prices now being asked is more uniform than for some weeks past, with an $11.50 per ton basis the minimum consideration. We quote as below, per gross ton, f. o. b. cars, Birmingham district furnaces, for any delivery within the next six months, viz.:

For delivery prior to last quarter:	
No. 1 foundry	$12.00
No. 2 foundry	11.50
No. 3 foundry	11.00
No. 4 foundry	10.50 to 10.75
Gray forge	10.00 to 10.25
Mottled	9.50 to 9.75
Standard basic	10.75 to 11.25
Off basic	10.50 to 10.75
Standard charcoal	22.50 to 23.00

With the exception of charcoal iron, an advance of 25c to 50c per ton would be asked over the above figures for deliveries in the last quarter.

Cast Iron Pipe.—No important transactions have been recorded in this market since last report, and the schedule of prices is unchanged. Several bond issues for municipal improvements have just been noted, thereby increasing the volume of prospective business. The local capacity is being operated almost entirely on specifications actually in hand, with the stock accumulation in any case very small. We quote water pipe as follows, per net ton, f. o. b. cars here, viz.: 4-inch to 6-inch, $23.50; 8-inch to 12-inch, $22.50; over 12-inch, $21.50, with $1 per ton extra for gas pipe.

Old Material.—An aggregate of 1,500 to 2,000 tons of cast and machinery scrap has just been sold in the Chattanooga and Knoxville, Tenn., territory, at prices in line with quotations. There was a fair movement of wrought and steel grades to local mills within the past week, while the local foundry trade has taken care of considerable tonnage of light cast and stove plate. The most important of recent transactions was the purchase of the equipment at a dismantled saw mill plant by the Kilby Locomotive & Machine Co. This transaction involved considerable tonnage of miscellaneous scrap, together with some mileage of old rails, and two locomotives. The material will be shipped to the Anniston, Ala., plant of the purchaser for rehandling. We quote as below, prices dealers are asking for their holdings, per gross ton, f. o. b. cars here, viz.:

Old iron axles (light)	$15.50 to 16.00
Old steel axles (light)	12.00 to 12.50
Old iron rails	12.00 to 12.50
No. 1 R. R. wrought	12.00 to 12.50
No. 2 R. R. wrought	10.50 to 11.00
No. 1 country	8.50 to 9.00
No. 2 country	6.50 to 7.00
No. 1 machinery	9.00 to 9.50
No. 1 steel	9.50 to 10.00
Tram car wheels	8.50 to 9.00
Standard car wheels	10.50 to 11.00
Light cast and stove plate	7.00 to 7.50

BUFFALO

Deliveries of Finished Material Deferred

Office of THE IRON TRADE REVIEW, Buffalo, June 25.

Pig Iron.—Both buying and inquiries fell off a little from last week's totals. The sales for the week in all grades amount to about 10,000 tons. The furnaces are holding firm to present prices, but the tendency of the quieting market has deferred, for the time at least, a disposition on the part of the producers to further advance their schedules. The range for the week is substantially as follows, f. o. b. furnaces:

No. 1X foundry	$14.25 to 14.75
No. 2X foundry	14.00 to 14.25
No. 2 plain	14.00
No. 3 foundry	13.75 to 14.00
Gray forge	13.50 to 14.00
Malleable	14.25 to 14.50
Basic	14.25 to 14.50
Charcoal	15.75 to 17.50

Finished Material.—On the surface the market has been quieter during the past week, but with numerous evidences of a substantial firmness beneath. There has been no disposition on the part of the mills to even shade prices in order to book favorable tonnages. While inquiries have slackened a trifle, all the interests reported considerable activity in specifications on contracts expiring at the end of the current month. Some of the interests say three and four weeks is the minimum on bars; five to six weeks on reinforcing bars; six to eight weeks on plates and shapes and on the latter products a few of the mills are unable to promise deliveries within three months.

With this condition prevailing prices are reported decidedly firm in all quarters. The business in spikes has been good, with the mills operating at capacity and extending deliveries three to four weeks. Sheets and tin plates have been active. There is a good demand for merchant pipe. The wire nails and wire products prices are firmly maintained.

Bids will soon be taken for the addition to the Crosby Co.'s plant, Buffalo, by Architect R. J. Reidpath, Builders' Exchange, this city. The Lackawanna Bridge Co. has the contract for the steel for the four new buildings for the American Radiator Co.'s Bond plant, Buffalo.

Old Material.—Few sales were made during the week in the local scrap market, it experiencing the same lull apparent in other lines. The schedule for the week, for gross tons, f. o. b. Buffalo, is substantially as follows:

Heavy melting steel	$12.75 to 13.25
No. 1 railroad wrought scrap	14.00 to 14.75
No. 1 R. R. and mch. cast scrap	13.50 to 14.00
Old steel axles	16.50 to 17.25
Iron axles	21.00 to 22.00
Car wheels	13.00 to 13.50
Railroad malleable, scrap	11.50 to 12.25
Wr'ght iron and soft steel turn.	8.00 to 8.50
Cast iron borings	7.00 to 7.50
Low phosphorus steel scrap	15.75 to 16.00
Old iron rail	15.00 to 15.50
Tank iron	10.00 to 10.25
Boiler plate, sheared	13.75 to 14.25
Pipe and tank	9.50 to 10.00
Stove plate	9.75 to 10.00
Sheet iron	7.00 to 7.50
Locomotive grate bars	11.00 to 11.25

METAL MARKETS

Tin and Copper Markets Unsettled

New York

June 25.

Tin.—The local market is still very uncertain. Spot supplies have been replenished to the extent of about 1,000 tons since June 18, but a considerable quantity of the arrivals was other than Straits tin, and there is an unknown amount of June contracts for the high grade metal, that may exceed the available supply and yet cause a flurry in the domestic market. Business was done at close to 49c for spot tin at the end of last week, but the market has since become easier. Spot closed today at 48c, June at 47.90c and July at 45.50c. The London dock strike situation is unchanged and no shipments were made from there to American ports this week. Standard tin prices have been firm in the foreign market. Spot closed today at £207 10s and three months at £198. Arrivals since June 1 aggregate 1,873 tons, and there are 2,454 tons afloat.

Copper.—A break of over £2 in the London standard copper market has caused an unsettled feeling in the domestic market for specific grades of the metal. Sales have not yet been reported at the equivalent of the foreign quotations, however, which is about 17.25c cash, New York, for electrolytic. The leading sellers continue to ask 17.75c delivered 30 days for electro, and cash New York metal is held at the same figure by a few important producers. Lake is held at from 17.75c to 17.87½c, and it is reported that the Calumet & Hecla brand is being withheld for an early advance to 18c. It is the opinion of the trade that the decline in standard copper abroad is a speculative incident and will have no effect on domestic prices. The market is entirely nominal at present, however, and pressure to sell would make lower quotations, as there is little demand. The London market closed at £77 2s 6d for spot and £78 for three months. Exports since June 1 are 18,961 tons.

Lead.—Business has been light since the advance, consumers having bought freely at lower prices. All sellers feel confident that the present level will be maintained for some time, however. The general selling price is 4.50c in New York.

Spelter.—Prompt spelter continues scarce and it can be readily sold at 7.10c in New York. July is 7c and August is 6.95c.

Antimony.—All grades of antimony are slightly firmer, with the exception of Hallett's, which is quoted ⅛ lower at 7.75c. Cookson's is 8.12½c, and Hungarian is 7.20c.

Chicago

June 25.

New Metals.—Lead and copper continue to advance and the situation is characterized by considerable active buying. We quote, dealers' selling prices, f. o. b. Chicago, as follows:

Lake copper, carload lots, 17¾c; casting, 17c; smaller lots, ¼c to ¾c higher. Spelter, car lots, 6.95c; lead, desilverized, 4.20c in 50-ton lots; corroding, 4.47½c; sheet zinc, 8.65c, f. o. b. La Salle, in car lots of 600-pound casks; pig tin, 48.25c; Cookson's antimony, 8½c; other grades, 7½c to 8c.

Old Metals.—There is a fair amount of buying with but little change in quotations. Dealers, however, express themselves as well satisfied with the situation.

We quote, dealers' selling prices, f. o. b. Chicago, as follows:

Copper wire, crucible shapes, 14¾c; copper bottoms, 13¼c; heavy cut crucible copper, 14¾c; heavy red brass, 12½c; heavy yellow brass, 10c; No. 1 red brass borings, 11c; No. 1 yellow brass borings, 9c; brass clippings, 9¼c; lead pipe, 3 1-2c; zinc scrap, 4¾c; tea lead, 4c; No. 1 aluminum, 12 1-2c; No. 1 pewter, 28c; block tin pipe, 41c; tin foil, 35c; linotype dross, 3¼,; electrotype dross, 3c; stereotype plates, 4 1-2c; stereotype dross, 3¼c; prime slab zinc dross, $90 a ton.

Iron Sheet Stands Test for 39 Years

The Alan Wood Iron & Steel Co., Philadelphia, is exhibiting a sheet of old-fashioned, puddled, black iron which was recently taken from the siding of the puddle mill of the company at Conshohocken, Pa., after having been in service since 1873, or for 39 years. Under the paint the metal appears as bright as when it was first rolled. The sheet had undergone a number of renewals of paint while in use and this had undoubtedly contributed to its almost perfect preservation. The analysis of the sheet shows 0.03 per cent carbon, 0.01 per cent manganese, 0.03 per cent sulphur, 0.133 per cent phosphorus, 0.20 per cent silicon and 0.026 per cent copper, or total impurities of 0.429 per cent, leaving the iron 99.57 per cent pure. The company is still manufacturing this quality of iron sheet for roofing and siding purposes.

REORGANIZATION PLAN

Of the McCrum-Howell Co.—New Securities to be Issued.

Plans for the reorganization of the McCrum-Howell Co., Chicago, which was recently thrown into a receivership, are being perfected. In a general sense there is to be no assessment on the stock of the company. The re-organization contemplates an underlying plan to which the stockholders will be admitted in preference to others. The principal value which will attach to the stock, therefore, will be one of privilege. A conservative estimate of net earnings per annum under the new management has been made at $225,000. The bank loans, which are approximately $1,500,000, and other current liabilities of about $500,000, will be met by issuing securities. In all probability there will be a scaling of a part of the indebtedness so that the new securities will have sufficient earning power behind them to make them moderately attractive to the old stockholders.

Locomotive Orders Placed

Orders for motive power equipment being placed by the railroads, while not as numerous as several weeks ago, are quite liberal. The Montpelier & Wells River railroad has placed two eight-wheel passenger locomotives; the Carnegie Steel Co. two six-wheel switching locomotives, the Central Railroad of New Jersey two eight-wheel switching locomotives and Mitsui & Co. one six-wheel saddle tank locomotive, all with the American Locomotive Co. The Grand Trunk railway system has also ordered 41 locomotives from the Montreal Locomotive Works. These will all be of the superheater Pacific passenger type.

The Wisconsin Iron & Wire Works, 184 East Water street, Milwaukee, Wis., was awarded the contract for furnishing and erecting the new lighting system for the $2,000,000 Grand avenue viaduct at Milwaukee.

ATTACK ORE RATE

Valley Steel Concerns Assail Ore Unloading Charge.

The recently promulgated charge of 10 cents a ton for unloading iron ore from vessels on the great lakes has been attacked before the Interstate Commerce Commission by ore consumers in the Mahoning and Shenango valleys. The attack has been aimed through the original petition which various valley manufacturers, including the Youngstown Sheet & Tube Co. and 16 other complaining concerns, filed on Jan. 3 last, against the L. S. & M. S. and P. & L. E. railroads. The latest attack is contained in an amendment to the original petition.

It will be remembered by readers of The Daily Iron Trade Review that the original petition complained of the 56-cent rate on iron ore from Ashtabula Harbor, O., to the Youngstown district and the valleys. It was alleged that this rate was "unjust, unreasonable and excessive," and the commission was at that time asked to fix a just and reasonable rate. To that complaint the Pennsylvania Co., the Pennsylvania Railroad Co., the Erie railroad and the Baltimore & Ohio asked that they be allowed to intervene, and this request was granted. This, in turn, was followed by a request from the complainants that they be allowed to file an amended petition, which they were allowed to do on June 12.

This amended petition includes all of the carriers named above, and alleges that each and all of them are engaged in the transportation of iron ore from Ashtabula Harbor and from Cleveland, all of the ore involved originating in Michigan and Minnesota, from which originating points it is transported by rail to the upper lake ports, reshipped and transported by boat over the great lakes to Ashtabula or Cleveland, and thence to points of consumption in the valleys and Youngstown district.

The complaint further sets forth that when running under normal conditions the plants in these two districts consume annually about 10,654,000 tons of ore, and of that amount about 5,000,000 tons are consumed in the works of the complainant companies. The average distance over which this ore has to be transported from the ports to the consuming points is about 60 miles. The rate charged for this transportation is 56 cents, of which 2 cents is for the taking of the ore from the rails of the boats and transferring to the cars of the defendants.

After the issues were joined, as above indicated, the Lake Shore & Michigan Southern, by its tariff I. C. C. A-2833, effective May 2, 1912; the Pennsylvania by its tariff I. C. C. F-379, effective May 3, 1912; and the Erie railroad, by its tariff, I. C. C. A-4608, effective May 4, 1912, put into effect and have since collected a charge of 10 cents per ton, gross weight, for taking, transposing and transferring the ore from the holds to the rails. It is this latter charge against which the amended petition is aimed, and which is alleged to be not only. unjust and excessive but unlawful.

These two cases have now been assigned for hearing in New York City, before Special Examiner Gerry, on July 29.

GARY OPERATIONS

Every Department Running at Capacity—Ore Receipts.

Although the season is still early, the Indiana Steel Co., Chicago, has a large amount of ore on hand at its Gary plant and in spite of the increased production will experience little difficulty in filling up the yard long before the season closes. Every department of the Gary plant is now operating at its utmost capacity. The new 60-inch universal plate mill is running very smoothly at present, turning out its rated tonnage. Considerable trouble was experienced when this mill was placed in operation recently, but this has all been overcome and no difficulties are being experienced at present.

Negotiating for Implement Makers' Merger

Waynesboro, Pa., June 25.—D. M. Good, J. J. Oller and S. M. Kitzmiller, the committee which secured options on the capital stock of the Geiser Mfg. Co., left this morning for New York for a conference with the promoters of the merger by which the Geiser company will become a part of a $15,000,000 or $20,000,000 concern for the manufacture of a general line of agricultural machinery. The options on the Geiser company shares, secured by the committee will expire July 1, and the outcome of today's conference may determine the finality of the negotiations which have been in progress for the past three months.

MUST RESTORE MONEY

American Ship Building Co. Loses Important Case.

Judge W. L. Day in the United States district court, at Cleveland, on Monday ordered the American Ship Building Co. to take back the steamers J. Q. Riddle, Abraham Stearn and Sheldon Parks from the Commonwealth Steamship Co. and to restore to the company the money that was paid for them, approximately $1,200,000. The decision has created a stir in lake circles and will undoubtedly be appealed.

In rendering the decision Judge Day adjudged the American Ship Building Co. guilty of fraud in granting secret commissions to W. A. and A. H. Hawgood for placing the contracts for these steamers. Litigation in the case has been long continued. It was originally started by Frank P. Whitney, a stockholder in the Commonwealth Steamship Co., who brought suit against the Hawgoods, making the Commonwealth Steamship Co. party defendant. The Hawgoods declined to answer any questions until the common pleas court ruled that they must do so, when they testified that they had received the following commissions upon steamers constructed for the Commonwealth Steamship Co.: A. H. Hawgood, $30,000; W. R. Woodford, $30,000; Sheldon Parks, $25,000; W. A. Hawgood, $25,000; Abraham Stearn, $15,000, and J. Q. Riddle, $5,000. No testimony was submitted as to commission paid upon the remaining vessel of the fleet, the H. A. Hawgood, as her construction had been promoted by Henry A. Hawgood, deceased.

Immediately upon this confession, the suit against the Hawgoods was withdrawn and a suit against the American Ship Building Co. was substituted to compel it to take back the steamers. Meanwhile, however, four of the steamers (the W. R. Woodford, A. H. Hawgood, Henry A. Hawgood and Wm. A. Hawgood) had been sold, and on behalf of these four steamers the company seeks to discover the difference between the contract price and the selling price. Judge Day, in his decision, directs the American Ship Building Co. to pay the contract price of the three steamers left in the fleet to the Commonwealth Steamship Co., together with interest dating from the time the contracts were made about five years ago. The steamship company is directed to pay to the builders the net profits of the operation of the vessels since they were built.

OPEN-HEARTH IRON

Will be Melted by Newark Foundry—Other Newark News.

Maher & Flockhart, operating a gray iron foundry on Polk street, Newark, N. J., have purchased an additional property adjoining their plant and including thereon several buildings, one of which is a four-story structure, 50 x 100 feet, formerly used as a tannery. This building is being remodeled for the storage of patterns and an elevator will be installed. There will also be installed in these extensions an open-hearth furnace with capacity of 10 tons. This will be oil-fired and will be employed in the production of gray iron castings for which especially pure metal is desired. By melting in an open-hearth furnace instead of a cupola the use of coke will be eliminated and the sulphur and other impurities in the fuel will be avoided. A foundry extension, 87 x 90 feet, will be built, the present cleaning room removed and three more sand blast equipments installed. This plant was founded in 1882 by Edward Maher, Thomas Robertson and James Flockhart, and originally consisted of a main foundry, 25 x 100 feet, and a smaller building, 18 x 18 feet. Today the foundry and its departments cover a tract of 7½ acres located in the heart of Newark. It now turns out 70 tons of castings daily. Its capacity when the contemplated improvements are completed will be about 100 tons daily. The foundry does jobbing work exclusively.

The Driver-Harris Wire Co., Newark, N. J., manufacturer of piano wire and other fine grades of wire, has just enlarged its equipment for rolling alloy strips and sheets. These include copper and nickel and specially high nickel sheets, nickel chrome and nickel manganese. The company is contemplating the erection of a new mill for rolling these sheets.

The Royal Machine Co. has moved from its old plant on New Jersey Railroad avenue, Newark, N. J., to a new location on Oraton street and Verona avenue, that city.

The Wolf-Andes Co., 90 Ferguson street, Newark, N. J., has sold its plant and property to Maher & Flockhart and will remove to Phun Point lane, in East Newark, where it will have a new plant, 35 x 100 feet. This company smelts and refines old non-ferrous metals, dross, etc.

The board of governors of the Traffic Club of Pittsburgh has elected officers for the ensuing year and has selected E. C. Sattley, traffic manager of the Page Woven Wire Fence Co., as chairman of the board, and all committees for the year were named. President F. A. Ogden of the club, who retired this year, was presented a handsome diamond stick pin by his colleagues.

OLDEST STACK

In Country Removed in Rapid Time at Port Henry.

Rapid work has attended the razing of the Port Henry, N. Y., stack of the Northern Iron Co., said to be the oldest furnace in the United States, which is being removed to clear the site for the erection of a new stack. The shell, which is double, and its appurtenances, were torn down in about two weeks and workmen this week began the building of the foundation for the new furnace. The use of an oxy-acetylene torch greatly facilitated the removal of the double shell and structural iron and steel work. The Northern stack was erected in 1872 and 1873 and the first iron was made in August, 1875. The blowing engines of the plant are also said to have been the oldest in use in this country.

HIGHER WAGES

For Puddlers Agreed to by the Manufacturers.

Pittsburgh, June 26. (By wire.) — The conference between the officials of the Republic Iron & Steel Co. and the Amalgamated Association resulted in the adoption of the same wage agreement as was accepted by the Western Bar Iron Association at the Buffalo conference. This is on the basis of $5.25 a ton on a 1 cent card.

Declared Stock Dividend

New York, June 26. (By wire.)—The Sharon Steel Hoop Co., Sharon, Pa., has declared a 33-1/3 per cent stock dividend in addition to the regular distribution of 1-3/4 per cent quarterly.

Wants Steel Coaches

New York, June 26. (By wire.)—The Seaboard Air Line railroad is out for 30 steel coaches.

Directors of the Chesapeake & Ohio Railway Co. on June 20, formally approved the plans for the construction of a new coal pier at Newport News, Va., which will cost in the neighborhood of $1,000,000.

GROUND BROKEN

For Blast Furnace Construction at Port Colborne, Ont.

Toronto, June 25. — Ground has been broken at Port Colborne, Ont., for the depression of the five tracks which will lead to the proposed blast furnace of the Canada Furnace Co., Ltd., to be built at an expenditure of at least $2,000,000. The working force will be gradually increased, and a large number will be needed for the erection of the plant.

The Canadian Pacific Railway has awarded to Deeks & Hinds, of Toronto, the contract for the construction of the first 60 miles of the double track line to be built between Port Arthur and Sudbury. The contract calls for all work in connection with the line such as grading, bridges, etc., and the work is to be completed before winter. The contract price is between $3,000,000 and $4,000,000.

HIGHER PRICES

On Plates, Shapes, Bars and Railroad Spikes.

Pittsburgh, June 26. (By wire.)—Plates, shapes and bars were advanced $1 a ton today by the Carnegie and Cambria steel companies and the Jones & Laughlin Steel Co., Republic Iron & Steel Co. and the Columbia Steel Co. will make similar advances on July 1. The Republic Iron & Steel Co. has advanced railroad spikes to $1.50, effective at once. This company has sold its entire output of southern iron for delivery through the third quarter and is now asking $12 for No. 2, Birmingham, for shipment during the last three months of the year.

Eleven Furnaces Idle

Pittsburgh, June 25.—The Carnegie Steel Co. is operating 48 out of its total of 59 blast furnaces. Seven idle stacks are the isolated furnaces not operated except under extreme conditions, involving a high selling price for iron. The other four are forced out for repairs, one at Edgar Thomson works, one at Ohio works, one at Mingo, and the other at Duquesne.

Some of these stacks will be idle for the next several weeks. The fact that the company has thus lowered the production materially of pig iron has revived talk of further buying in the open market.

A Boring, Milling, Drilling and Tapping Machine

Centralized Control a Feature of Its Design—Machine Also Can be Arranged for Splining, Oil-Grooving and Thread Cutting

A combined boring, milling, drilling and tapping machine on which the operations of splining, oil-grooving and thread cutting also can be accomplished, is now being built in two sizes by the Rochester Boring Machine Co., Rochester, N. Y. The most striking feature of the machine is the centralized control. Every change of feed, speed or traverse in every direction, as well as the starting, stopping and reversing are instantly obtainable from one position convenient for the operator. The operating levers are so arranged that no two conflicting levers can be engaged at the same time.

The machine is designed so that the various machining operations can be performed at the same setting of the work, and with the revolving table mounted on the regular table supplied with the machine, the different sides of the work can be finished with only one setting. Advantage has also been taken of the fact that it is much easier and quicker to adjust and operate a saddle of relatively small constant weight and counterbalanced than to adjust the work to the tools. By centralizing the driving and feeding mechanism in the saddle or head, an unusually simple design has been developed, insuring maximum efficiency in power transmission through the elimination of all superfluous shafts, joints and gearing.

The aim throughout the machine has been to make the drive as direct as possible. When motor-driven, power is applied direct to the vertical driving shaft, and when belt-driven, the machine is belted direct to the shaft, a clutch for starting and stopping being provided in the main driving pulley. Another feature that has made possible the centralized control and simple design, is the method of feeding the spindle. The screw-feed principle employed provides for a continuous feed for any length of the spindle, the feed being applied concentric with the spindle, and between the two main bearings.

Fig. 2 shows the principle of the feeding and driving mechanism and also partly illustrates the construction of the saddle with its contents. It will be noted that the spindle has its own independent bearings at the extreme ends of the saddle, giving very rigid support. The bearings are of phosphor bronze, tapered and quickly adjustable from the outside in case of wear. The spindle sleeve, *B*, on which the driving gears, *A*, are mounted, has its own independent bearings, and clearance is provided between the sleeve and the spindle so that neither one comes in contact with the other and any possibility of transmitting vibration to the work also is eliminated. The spindle is rotated by the long spline keys, *C*, fitted in the driving sleeve and engaging the double splines in the spindle, giving a balanced system of driving. The spindle sleeve, *B*, has gear teeth cut on one end which mesh with the three pinions, *E*, that are mounted on the studs that form part of the differential feed driving gear, *D*. Through the double internal gear, *F*, and the three pinions, *G*, which mesh into the spindle feed nut, *H*, the latter is positively rotated at the same speed and in the same direction as the spindle as long as the feed drive gear, *D*, remains stationary, which is the case when feeds are disengaged. When the feed is applied the spindle nut is rotated faster than the spindle by accelerating feed drive gear, *D*, according to which feed change gear is engaged, or slower than the spindle by retarding feed drive gear, *D*, if the feed is reversed. This differential speed between the nut and spindle gives feed in either direction. Through positive planetary gearing the bar is controlled by an operating hand wheel, whether at rest or in operation. The nut comes in contact with the sides only of the thread on the spindle, and end thrust in either direction is taken direct on ball bearings of large diameter. End thrust for milling is taken direct in the saddle with bronze thrust bearing, independent of the end thrust for boring.

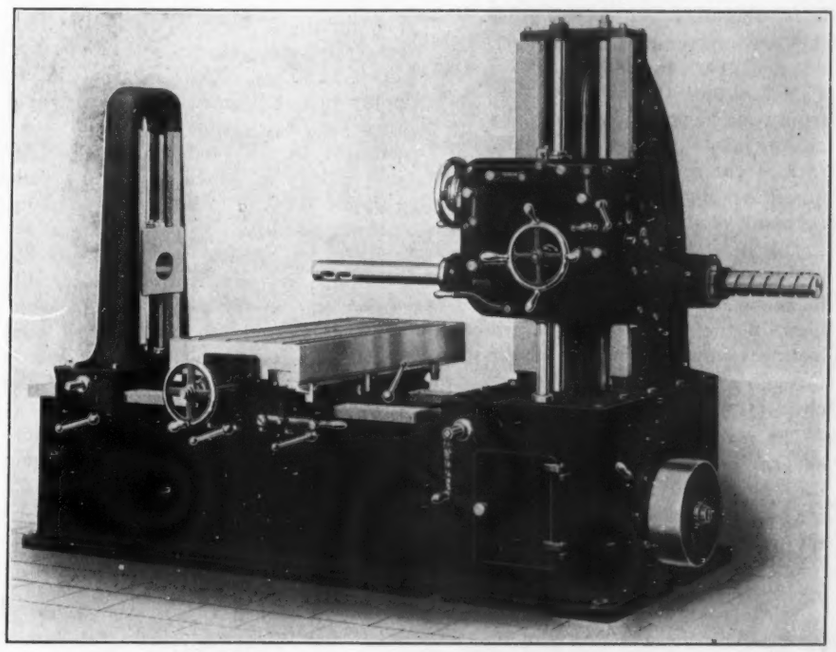


FIG. 1—ROCHESTER TABLE TYPE BORING, MILLING, DRILLING AND TAPPING MACHINE

All feeds before being applied to the different parts are transmitted through a friction clutch. This also provides a yielding point for the feeds when desired, insuring safety against damage or accident; otherwise all the feeds are positive. The feed is taken from the shaft that rotates the spindle so that all gears are per revolution of spindle.

At the source of power for the feed, the feed reverse mechanism is located, as shown in Fig. 3. This arrangement permits the feed to be

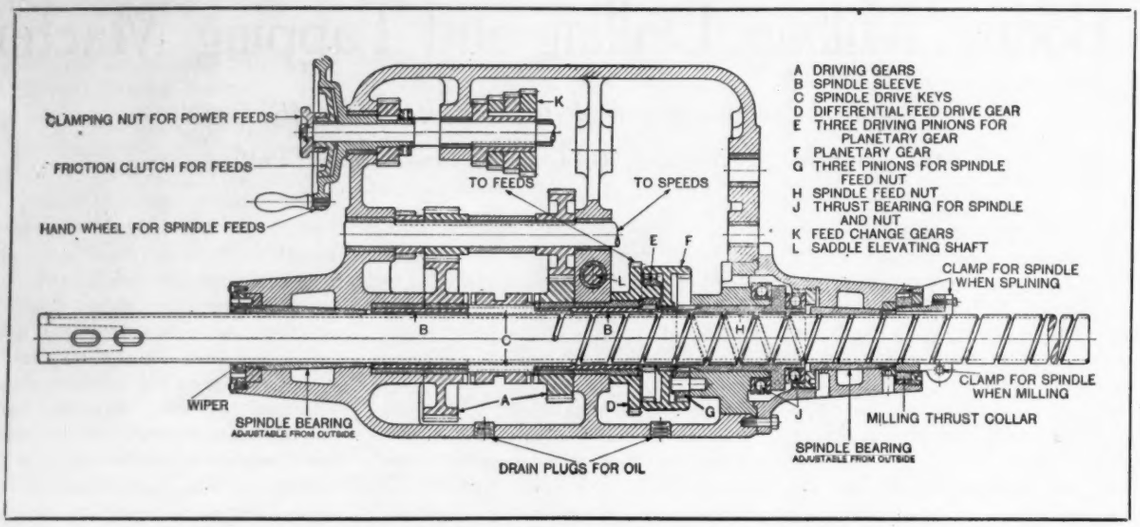


FIG. 2—SECTIONAL VIEW OF THE DRIVING AND FEEDING MECHANISM

reversed quickly when desired without stopping the machine. This new feed reverse principle eliminates all keys, tumblers and bevel gears, and the drive is applied at the periphery of the gear, instead of the center. Fig. 3 shows the method of shifting from one gear to another by feed change gears driving the shaft. The rack is cut on one end, so that shifting is readily obtained with the gear segment shown.

The driving shaft has double driving keys solid on the shaft, which is made of nickel chrome steel. A side view of the gear is shown, which illustrates how the driving shaft slides through it for the different feed changes which are instantly obtained.

The main high-speed driving clutches are located in the saddle between the column ways, the operating lever for starting, stopping and reversing the machine being connected thereto and conveniently located at the front of the saddle. The spindle has 12 speed changes.

Sixteen boring and drilling feeds are provided, as well as 16 different feeds for the saddle and the table. Feeds and the feed-operating levers apply to all parts. Power rapid traverse of constant speed and independent of the feeds is provided for all parts traversed, including the spindle, saddle, table and carriage. Automatic limit stops also are arranged for all traverses in every direction, in addition to adjustable knockout for the feeds of the table. It is impossible to engage two conflicting levers, and no two feed speeds or traverses can be engaged at the same time.

The drive and feed gearing is enclosed, running in oil. An oil pump lifts the lubricant to a reservoir at the top of the saddle and from this point it is distributed by leaders to the different bearings, the overflow running over the gears. The main castings, such as the bed, main column, table, carriage and outer support are all liberally proportioned for strength and rigidity. The bed is of continuous web construction and is closely ribbed in both directions. The main drive through the bed to the operating mechanism is simple and direct, and can be arranged either parallel to the machine or at right angles, using the same parts for either drive. Chutes are provided in the bed for removing the chips at the rear. A reservoir is also provided at the end of the bed for the use of cutting oils or lubricants. The main column, in which the counterweight for the saddle travels, is bolted and dowelled to the bed. It is of deep section and has a large surface bearing.

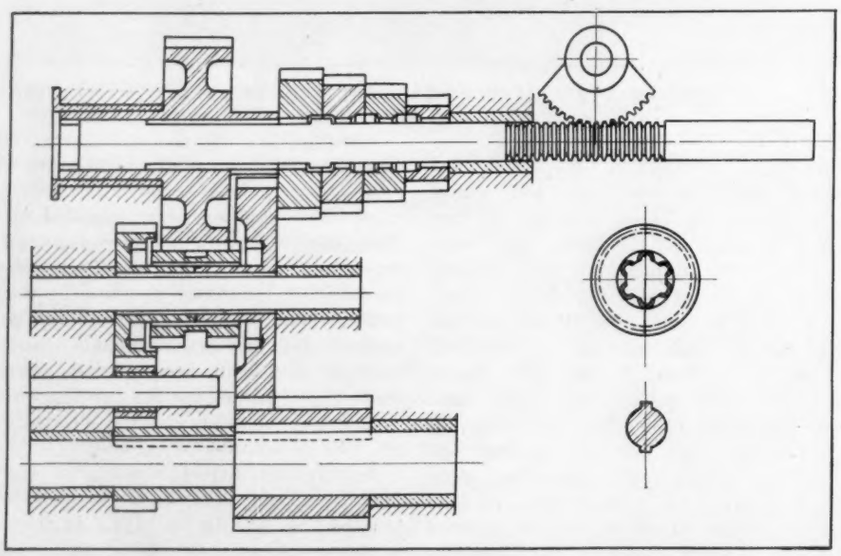


FIG. 3—SECTIONAL VIEW OF FEED REVERSE AND FEED CHANGES

The vertical shaft in front of the saddle is directly connected with the feed gearing in the saddle. The feeds and traverses are transmitted through this and the shaft in the bed to the table. At the table the feed is distributed either for the cross feed of the table or to elevate the saddle and outer support. The locking binder for the table is conveniently located in the carriage, and the clamping of the table is always directly under the spindle where the work is done.

All screws, including the screw for moving the carriage laterally, are located between the ways at the center of resistance. The column for outer support is removable from its base without disturbing its alignment and the operation connections, and an indicator is provided so that support can be replaced and its bearing lined up with the spindle without readjustment. The nuts for the screws are

made in two parts to provide for taking up wear and back lash. All nuts rotating screws have bearings independent from the threads.

Fig. 4 illustrates the knock-out or limit stop for the travel of the spindle. An intermediate gear, located between the feed change and the feed drive gear, rotates the screw to which it is applied, the lead of thread on the screw being proportioned so as to move a nut a certain pre-determined distance, representing the limit travel of the spindle. At the extreme travel of the nut on the screw a lever segment is actuated automatically which disengages the feed back gear clutch, throwing the same to neutral, thereby stopping the feed in either direction.

The machine is also arranged for splining by using the power rapid traverse driving the spindle in and out without rotating. To accomplish this, the spindle gear clutch is brought to neutral position, disengaging the spindle driving gears, and a key is inserted in the milling clamp collar at end of the saddle, which also engages one of the splineways in the spindle. The milling clamp collar is held in rotation by a friction band which is tightened by a thumb screw on the outside of the bonnet while splining. The collar and spindle are thus secure against relative rotation, but the spindle is guided in its lengthway motion by the key.

Spiral oil groove cutting of different pitches can also be accomplished on this machine by using the power rapid traverse for traveling the spindle and at the same time engaging one of the spindle speeds, thereby rotating the spindle. By the combination of direct and back gears for the feeds and the 12 speed changes for the spindle, different pitches of oil grooves or threads can be cut. When cutting spiral oil grooves the clamping collar used for slotting is, of course, disengaged.

When milling, the end thrust is taken by a bronze thrust bearing located at the rear end of the saddle.

An indicator is provided on the front nose of the saddle, showing the center of the spindle. This machine is built in two sizes with 3 and 3½-inch spindles, respectively.

The Indiana Machine & Wire Co., of Indianapolis, has been incorporated. The capital stock of the concern is $30,000. The directors are George W. Whittington, Fay H. Irwin and Millard F. Cox. The company will do a general jobbing and manufacturing business in machines and wire.

Romance of the Cut Nail Industry

An exceedingly interesting historical sketch of the cut nail industry of the upper Ohio valley is contained in a 16-page brochure, issued by La Belle Iron Works, Steubenville, O. The first cut nail factory was built in 1808 at Steubenville, and three years later another plant was erected at St. Clairsville, O., a few miles south of Steubenville. Another primitive plant was the "Top" mill, erected at Wheeling, by Thomas Sweeney and John Schonberger, in 1834. In the pioneer days, it is stated that nails were a luxury. Barns and residences were still being built by tenons, mortises and hard wood pins. The forerunner of the many nail mills that dotted the banks of the Ohio river and gave the name "Nail City" to Wheeling, was the Virginia mill, erected in 1847. It was equipped with 40 nail-making machines, and in 1852 this mill was sold and its equipment was removed to Benwood, south of Wheeling, where it was known as the Benwood Iron Works. The capacity of this plant was increased from time to time and in 1886, 174 machines were in operation. In 1849 the Belmont mill was erected and in 1886 it was equipped with 116 machines.

The Eagle Wire Mill and La Belle Iron Works were organized in 1852, followed by the Wheeling Iron & Spike Works, in 1869, and the Riverside Iron Works, now part of the United States Steel Corporation. The Jefferson Iron Works, at Steubenville, were established in 1856 and operated 160 machines. In 1867 the Bellaire mill was placed in operation with 25 machines, and in 1874 the Ohio City plant at Martins Ferry, O., was established. The latter was reorganized in 1876 as the Laughlin Nail Co., and operated 192 machines. Last in the list of the mills erected in the upper Ohio valley was the Spaulding, at Brilliant, in 1883, which operated 78 machines. The ten nail mills located in Wheeling and vicinity had a combined equipment of about 1,500 nail machines with a capacity of 73,000 kegs per week, or 3,650,000 for a year of 50 weeks.

All these mills used hand-fed machines, cutting wrought or puddled iron. In the latter 70's the use of Bessemer steel for nail making came into vogue. Owing to the economies effected as compared with puddled

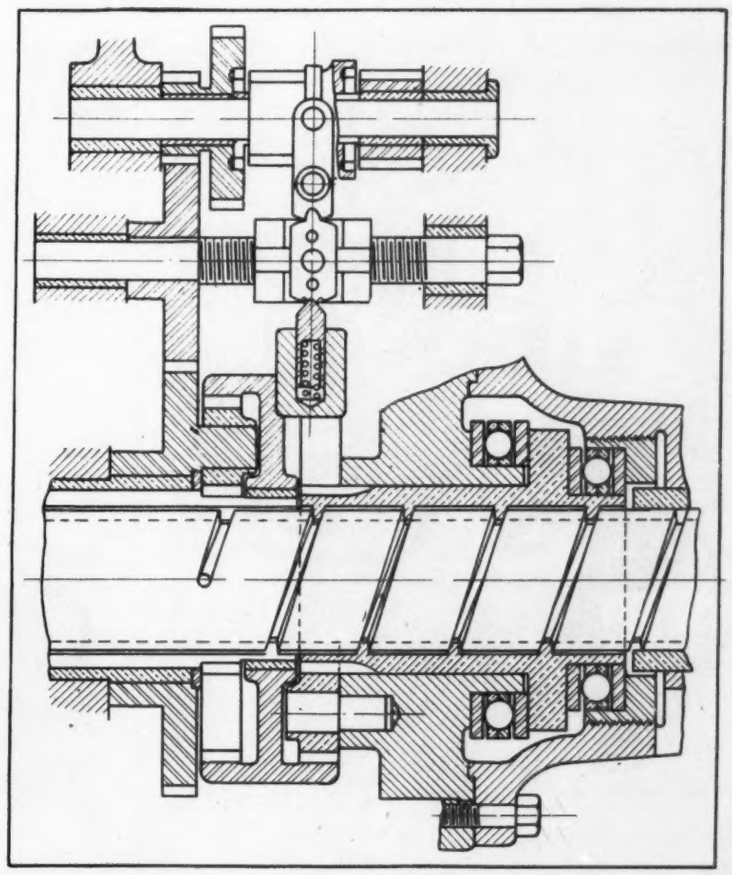


FIG. 4—SECTIONAL VIEW OF AUTOMATIC LIMIT STOPS FOR SPINDLE TRAVERSE AND DIFFERENTIAL DRIVE MECHANISM

iron, it was soon universally adopted and continued in general use until open-hearth steel was available. At about this time self-feeding machines were perfected.

It is stated that mill men were paid according to the quantity of perfect nails produced and the puddler received about $6.75 per gross ton or about $8 per day, from which he paid his helpers. The shearman, heater and roller were also paid by the ton. In the early days of this industry the plate roller received from $40 to $50 per week. The nailer was paid for each keg on what is known as the 10-penny common card base. Smaller and larger than 10-penny were paid lower or higher prices, according to the extra work involved in their manufacture. The nailer earned approximately $12 per day. Considerable space is devoted in this booklet to the nailers' strike inaugurated on June 1, 1885. This was precipitated by the difference in wages paid by the eastern mill manufacturers which enabled them to invade the western markets. The Western Nail Association mills demanded a reduction of approximately 20 per cent and not until June 25, 1886, was a settlement effected. During the strike the cut nail industry was practically at a standstill and the wire nail made big inroads in the cut nail market during this period. Although the annual output of cut nails has been reduced materially, La Belle Iron Works continues to manufacture a complete line in all sizes.

A New Flat Turret Lathe

A flat turret lathe of novel design and massive construction is now being built by the modern Machine Tool Co., Cincinnati. Careful attention was given to the arrangements of its various parts so as to secure ease of manipulation, compactness and simplicity.

Fig. 3 shows the massiveness of the head and bed and the general construction of the machine. The head contains the cone pulley, friction back gears and the automatic roller feed and chuck. The cone and gears give the machine 12 spindle speeds in exact geometric progression, ranging from 24 to 465 revolutions per minute. The crescent-shaped bed rests on a three-point bearing, being reinforced under the front spindle bearing.

This machine is manufactured on the unit system of construction, eliminating, to an appreciable extent, individual fitting in the assembling of the lathe, and insuring interchangeability of parts. The plain bearings are scraped to master surface plates and straight edges. The shaft bearings are ground and are provided with removable bushings, which may be replaced when worn without disturbing the alignment of the shafts, while all sliding surfaces and revolving parts are provided with liberal and efficient means of lubrication.

The belt shifter is operated by the hand wheel in front of the head within easy reach of the operator. The motion from the hand wheel is transmitted to the belt loop through an intermittent rack and pinion. A similar device is suspended from the countershaft and operates in unison with the device on the head through the knuckle joints and connecting rod. The belt loops are so timed that a half turn of the hand wheel to the left shifts the belt from the larger step to the small step on the head, while the loop on the upper device holds the belt out of contact with the edges of the cone on the countershaft. The next half turn of the hand wheel moves the upper loop in line with the corresponding cone on the countershaft. Thus, it will be seen that one turn of the hand wheel shifts the belt from one step to another in either direction.

The automatic chuck is operated by a single movement of a lever in front of the head and is constructed for handling rough bars. One set of

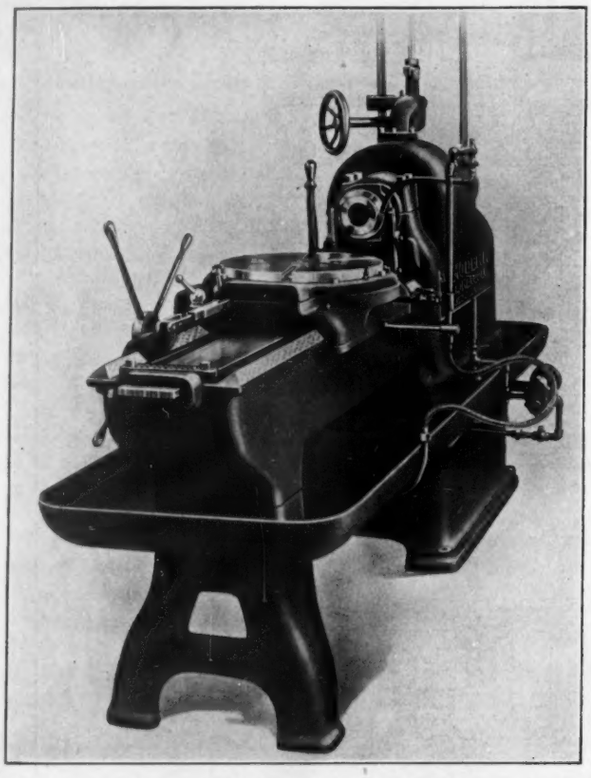


FIG. 1—END VIEW OF NEW FLAT TURRET LATHE

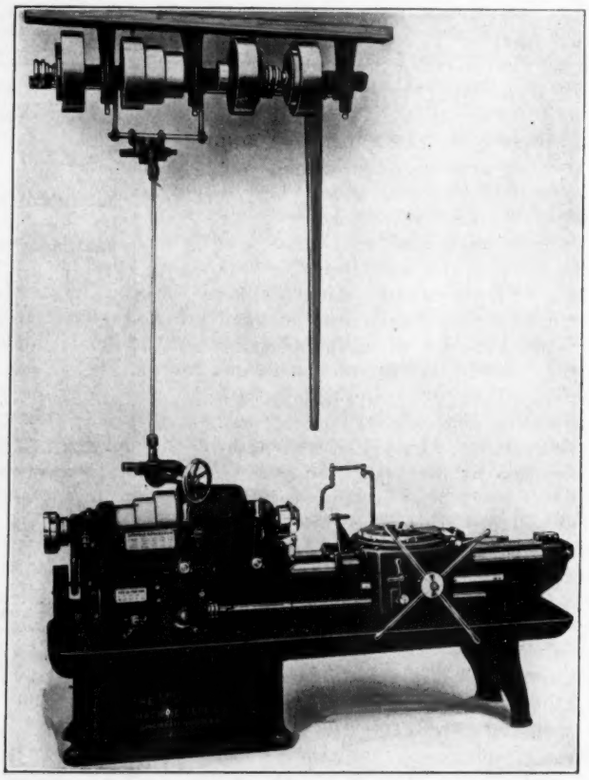


FIG. 2—FLAT TURRET LATHE, SHOWING COUNTERSHAFT AND BELT SHIFTER

jaws is adjustable for the full capacity of the machine.

The automatic roller feed has only three moving parts. It is mounted on the spindle back of the front bearing and is operated by the same lever and movement that opens the chuck. It operates only when the chuck is open. The head and bed are cast in one piece. The head is very massive and is friction back-geared, the back gears being located within the head directly under the spindle.

The feed gear box is driven from the spindle. Eight feeds are instantly obtainable, ranging from 0.005 to 0.085 inch per revolution of spindle and may be operated in either direction. These feed changes are obtained by means of the lever and crank handle shown at the front of the gear box. Motion from the feed box is transmitted through a disc friction and knuckle joint through the carriage feed rod. The gears, cone pulley and all moving parts are covered to prevent injury to the operator.

The carriage has a system of 12 stops so arranged that two may be used for each tool. A steel cover plate in the form of a slide is provided to close the opening containing the carriage stops which gives easy access to the stop for oiling and inspection. A binder is provided for securely clamping the carriage to the bed for forming and cutting-off operations. The backward movement of the carriage automatically turns the turret to each position when the tool leaves the work, and is so arranged that it may be turned to any one of the six positions without making any other stops. The adjustable dog for operating the index bar is clamped to the V-way and governs the position of the saddle at the time when the turret begins to revolve. The carriage is provided with independent, adjustable stops, which operate automatically for each position of the turret and may be operated in any desired combination when two or more are needed for any position of the turret.

Bar stock up to 2¼ inches in diameter can be fed through the chuck and turned any length up to 26 inches. The swing over the bed is 20 inches, and over the carriage 16 inches. The spindle has a front bearing, 4⅜ inches in diameter by 7½ inches long and a rear bearing, 3½ inches in diameter by 5½ inches long.

The turret is 18 inches in diameter and is provided with T-slots of ample proportions, permitting the use of substantial planer head bolts for securing the turning tools to the turret. These can be secured back of each other for turning several diameters at one movement of the turret. The index is large in diameter and the lock bolt is located directly under the working tool.

The triple friction countershaft has pulleys 16 inches in diameter for a 4½-inch belt. The cone has three steps, the largest diameter being 14½ inches, and carries a 4-inch double belt. The net weight of the machine is 4,500 pounds.

TWO SIZES OF PORTABLE TOOL RACKS BUILT BY THE NEW BRITAIN MACHINE CO.

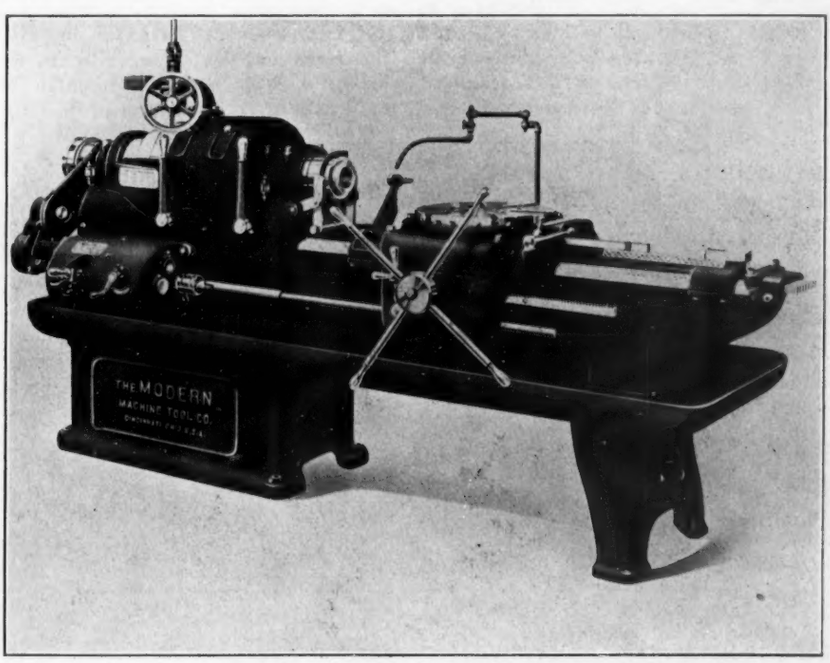


FIG. 3—NEW FLAT TURRET LATHE BUILT BY THE MODERN MACHINE TOOL CO.

Steel Tool Racks

In the accompanying illustration are shown two sizes of portable, steel tool racks or work stands, built by the New Britain Machine Co., New Britain, Conn. Although made of steel, these are practically identical in appearance with the cast iron tool racks placed on the market by this company in 1899. The rack at the left is 26 x 32 inches and the one at the right, 20 x 26 inches. The easily-cleaned, rounded, internal corners which were a feature of the cast iron pans, have been retained in the drawn steel trays. Return flanges on the edges strengthen the pans and contain corner braces into which the legs are tapped for the upper tray and through which the legs pass in the lower trays. The lower pans may be set any desired height on the legs. In all trays the

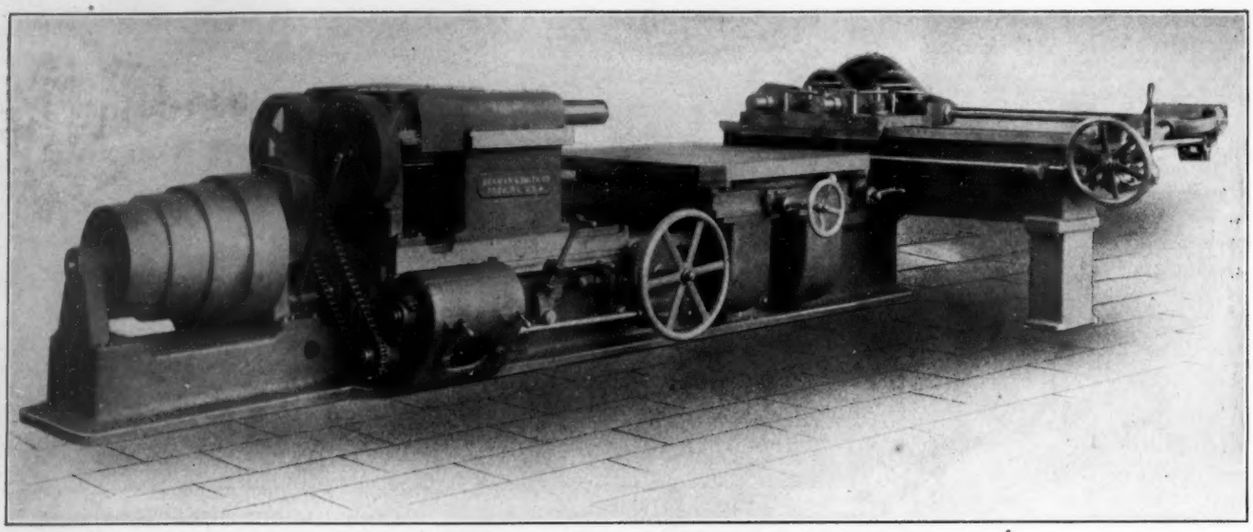


FIG. 1—UNIVERSAL CYLINDER BORING AND MILLING MACHINE

rivet holes and openings for the legs extend to the top edge of the pan, thereby preventing leakage. Each pan is provided with legs and casters of a size suitable to the load to be carried. The casters are provided with ball bearing swivels, the bearings being in a retainer cage. The trays are so constructed that they can be shipped readily, knocked down and easily re-assembled at point of destination.

The Winnipeg, Can., branch of the H. W. Johns-Manville Co., New York City, has removed into larger quarters at No. 92 Arthur street. The building is 100 x 50 feet, six stories and a basement, and will be occupied throughout by the company's offices and storerooms. A much larger stock of products will be carried on hand than was possible heretofore and an increased force will be employed.

Cylinder Boring and Milling Machine

The Beaman & Smith Co., Providence, R. I., is now building a universal cylinder boring and milling machine, designed to bore twin-cylinder automobile engine castings and at the same time to mill the flanges on two additional castings. By revolving the table, the castings that have been milled are placed in position to be bored. As shown in Figs. 1 and 2, the machine is provided with a carriage at one end equipped with two boring heads, each carrying two spindles. At the opposite end the bed supports a cross-head carrying a saddle with two milling spindles, and near the middle of the bed is a revolving table. This table is 54 inches square and is provided with ball bearings so that when raised into position by a hand wheel, these bearings take the weight of the table and allow it to be revolved easily. The table, however, does not rest on these ball bearings when the machine is in operation, but is supported on a scraped surface of large diameter. The table has four stop pin holes and can be securely fastened with a locking pin after locating.

The carriage is 34 inches wide and 54 inches long and has a 30-inch movement on the bed. It has a quick power movement of 5 feet per minute in either direction, independent of the spindle drive. The head base is so placed on the carriage that the front end of the latter extends beyond the end of the spindles and passes under the table for the purpose of distributing the wear as uniformly as possible.

The milling saddle is 20 inches wide, 41 inches long and has a movement of 52½ inches on the cross-head, as well as a quick power movement from 6 to 11¾ feet per minute in either direction. The feeds for the carriage are at the rate of 4, 8, 16 and 32 revolutions of the spindle to 1 inch travel of the car-

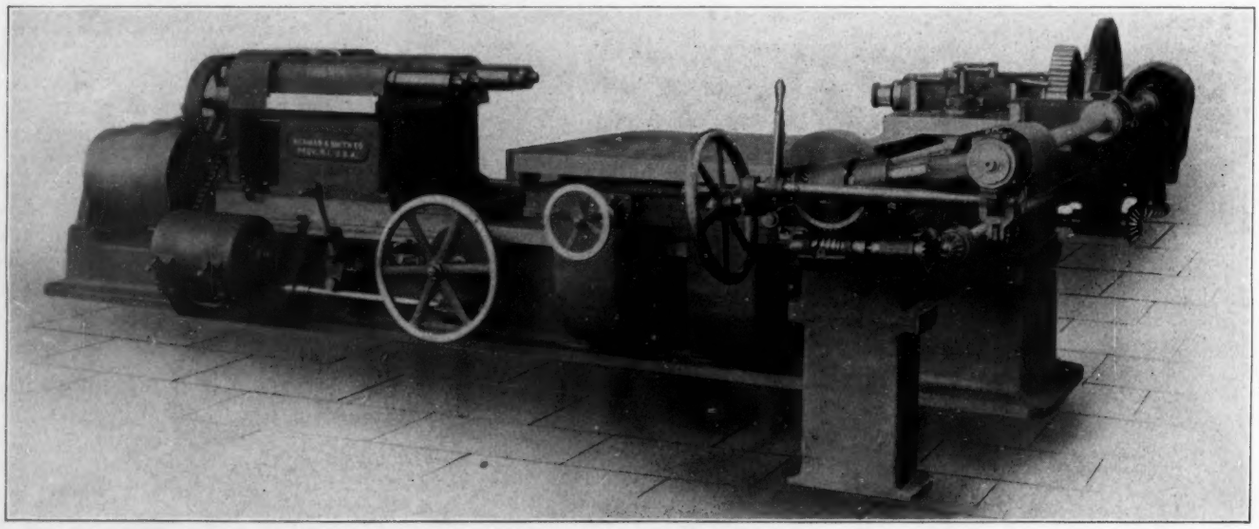


FIG. 2—UNIVERSAL CYLINDER BORING AND MILLING MACHINE, SHOWING THE REVOLVING TABLE AND CROSS-HEAD EQUIPPED WITH TWO MILLING SPINDLES

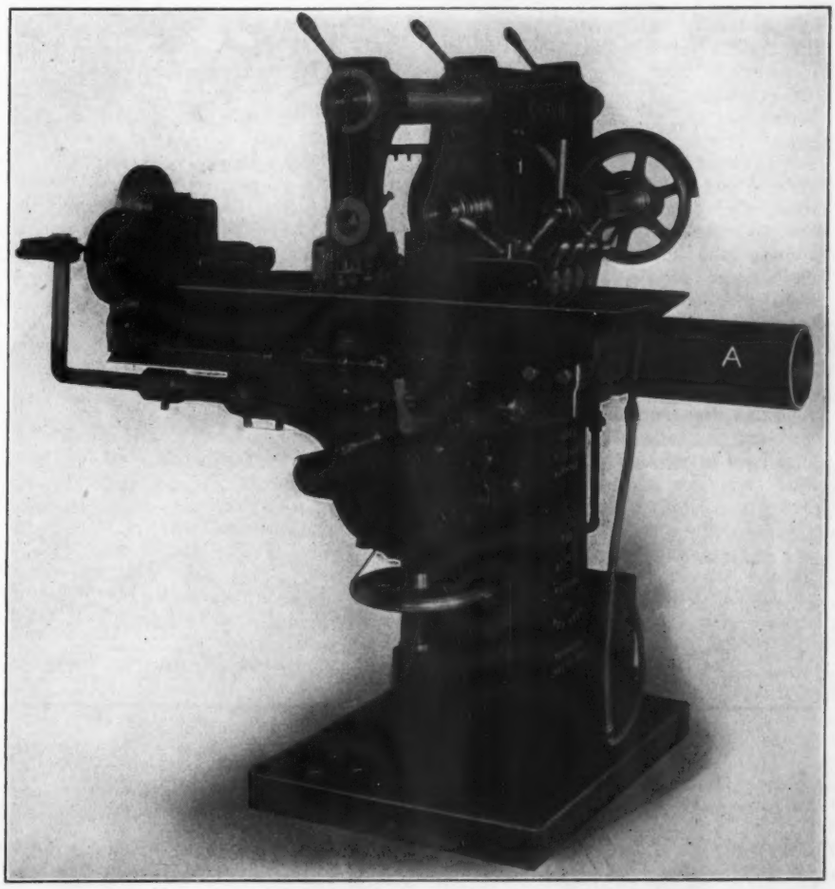
riage. The feeds for the milling head are from 1 to 4¼ inches per minute at any spindle speed.

The ends of the four boring spindles are made to fit cutters as may be specified. The front bearings are 4 inches in diameter and 6 inches long and the rear bearings are 2¾ inches in diameter and 5 inches long. The spindles are fitted in twin heads geared in the ratio of 8.4 to 1, giving speeds of 22½, 28, 35 and 44 revolutions per minute. The two milling spindles have tapered ends, 3 inches in diameter, for face milling cutters. The front bearings are 4 inches in diameter and 6 inches long and the rear bearings are 3 inches in diameter and 5 inches long. Gearing in the ratio of 21½ to 1 gives speeds of 7½, 10 and 14 revolutions per minute. The boring spindles are driven by a 6-inch belt on a four-section cone and the milling spindles are driven by a 5-inch belt on a three-section cone.

The minimum distance from the center of the table to the face of the boring heads is 27 inches and the maximum distance 57 inches. The distance from the center of the spindles to the top of the table is 9⅝ inches and the minimum distance from the center of the table to the end of the milling spindles is 28¾ inches, while the maximum is 31¾ inches. The machine weighs approximately 28,000 pounds.

Automatic Index Milling Machine

An automatic index milling machine, designed for fluting taps and reamers, cutting gears, ratchets, etc., and adapted to the automatic performance of repetition work, is shown in the accompanying illustration. This machine, which was built by the Garvin Machine Co., New York City, contains many improvements not incorporated in the automatic index milling machine previously built by this company. These include a quick-acting work-holding apparatus, an automatic index, automatic feed with quick return which is checked by an air cushion, and the automatic stopping of the machine when the work is completed. When finishing a cut the machine is tripped by a dog on the table which releases the latch, permitting the worm to drop out of mesh with the worm gear. The table is thereby released from the power feed and moves back to the extreme of its travel, being actuated by a spring enclosed in a tube at the rear of the table. This rapid motion is checked before the table reaches its fixed stop by the air cylinder, *A*. When the dog trips the machine the stop collar on the screw at the front of the table comes in contact with the bracket and trips the tilting table by means of a cam shaft. This permits the return of the work without the cutter dragging. As the table approaches the extreme return position the right hand dog on the table contacts with the stop plunger, bringing the worm back into mesh with the worm gear, when the table comes to rest. The right hand stop collar on the screw also lifts the tilting table back to its work position, also lifting the index pawl to indexing position and permits it to fall back immediately. The machine is then ready for another cut and this operation is repeated until the work is finished.



NEW GARVIN AUTOMATIC INDEX MILLING MACHINE

The machine then trips again and after indexing the projecting pin on the index dial it pushes the corresponding sliding pin on the cross bar at the left of the machine, knocking off the eye of the rope connecting with the spring on the countershaft, thereby stopping the machine. The machine has a capacity of 16 inches between centers and a cut, 7½ inches long, can be taken between any points in this distance. The centers have a capacity for holding work up to 2 inches in diameter on all four spindles and on the two outer spindles up to 4 inches in diameter.

Utilization of Sulphur Bearing Gases

The gases and waste products issuing from the flues of smelters, roasters, blast furnaces, and so forth, are made up chiefly of dust, the oxides of sulphur, carbon dioxide, and nitrogen. According to W. C. Phalen, of the United States Geological Survey, in an advance chapter on sulphur, pyrite, and sulphuric acid from the volume "Mineral Resources of the United States" for 1911, the oxides of sulphur, on account of their deleterious action on vegetation, have caused almost endless litigation in some parts of the country where they were formerly allowed to pour forth into the atmosphere. Various methods have been adopted to overcome the evil effect of sulphur dioxide, but they have met with only partial success. In view of this fact processes have been devised whereby these waste sulphur gases may be converted into sulphuric acid or into sulphur. Sulphur gases are converted into sulphuric acid at Ducktown, Tenn., and a process of separating sulphur from such gases has recently been tried experimenally at Campo Seco, Cal.

New Processes for Chilling Gray Iron Castings[1]

Results of a Large Number of Experiments for the Mechanical Production of Outside and Inside Chills in Castings

By Thomas D West

Conditions are occasionally such that an *inside chill* is produced in castings, by which is meant that a casting with a gray or soft exterior may have the interior, or portions of it, composed of a hard, white or chilled iron, as shown in Figs. 1, 2 and 6. While inside chilling is claimed to be produced by hydraulic pressure, this is not the inside chill which has puzzled foundrymen, and prior to the mechanical creation of inside chill by the author, no one, as far as he knows, has explained how it could be produced at will. The discovery of how this can be done is due largely to experiments which the author has been conducting during the past two years with a view to overcoming the defects now existing in chilled car wheels, and this investigation led to other lines of research, which hereafter will be explained.

Most of the experiments were made at the West Steel Casting Co., Cleveland. This company makes castings by the converter and crucible methods, the former requiring a cupola similar to that used in iron founding, and this iron was used for casting chillable metals. The irons used were approximately of the following composition: Carbon, 2.75 to 3.25; silicon, 1.75 to 2; sulphur, around 0.06; manganese and phosphorus, each about 0.04. In cases where a more chillable metal was desired, small portions of stick or powdered sulphur were dropped on top of the molten metal when in the hand ladle.

[1]Presented at the meeting of the American Society of Mechanical Engineers, held at Cleveland, May 28-31.

Producing an Inside Chill

In Fig. 3 is illustrated the experiment that created mechanically an inside chill. This gives views of the mold used in casting test specimens in open sand of the size shown at *A*, Fig. 9. The bar, *A*, Fig. 3, was cast against a chiller block, *E*, while bars *B*, *C* and *D* were surrounded with rammed sand. The bars having been poured, the gate connections, *F*, *G*, *H* and *I* were broken and the sand around *C* and *D* was removed as soon as the solidification of the bars would permit. When it was believed that bars *C* and *D* would withstand the pressure of tongs, they were lifted quickly and *C* was immersed in water, while *D* was broken to display conditions of its interior. The immersed bar, *C*, having cooled to a dark color, was taken from the water and broken, and displayed an inside chill, shown at *E*, Fig. 1. The bar, *D*, showed an interior condition bordering on semi-molten metal. The chilled bar, *A*, showed that the chiller, *E*, had chilled the surface of *A* about ½ inch deep, while the bar, *B*, had a fine gray fracture. Bars, *A* and *B*, were not removed from their molds until nearly cold.

To mechanically create an inside chill the outside body of a casting should cool slowly enough to allow the carbon to take a graphitic form, while the inner body, which is not wholly solidified, is cooled so rapidly that the carbon is held in the combined form, similar to the way it is held in the molten metal. The graphitic state of the carbon in the solidified body causes the iron to be gray and soft, while the combined state causes it to be hard and white, or chilled.

The ability to create an inside chill by strictly physical manipulation led to the belief that it might be practicable to increase the depth of a chill beyond what present chillers can do, with like irons. Especially was this believed practicable for such castings as chilled car wheels and rolls. Several methods were devised for testing purposes, but finally those in Figs. 4, 5, 10 and 15 were adopted for the chief researches. These devices admitted of a wide range for experiments and as a rule led to satisfactory results.

The following explanation is given of actions that take place and of conditions that exist in the process of chilling:

(a) Chillable iron is chilled prior to any formation of graphite. A chill may be made harder by continuing to cool it while the adjoining metal is still in a semi-molten state or very hot; as by

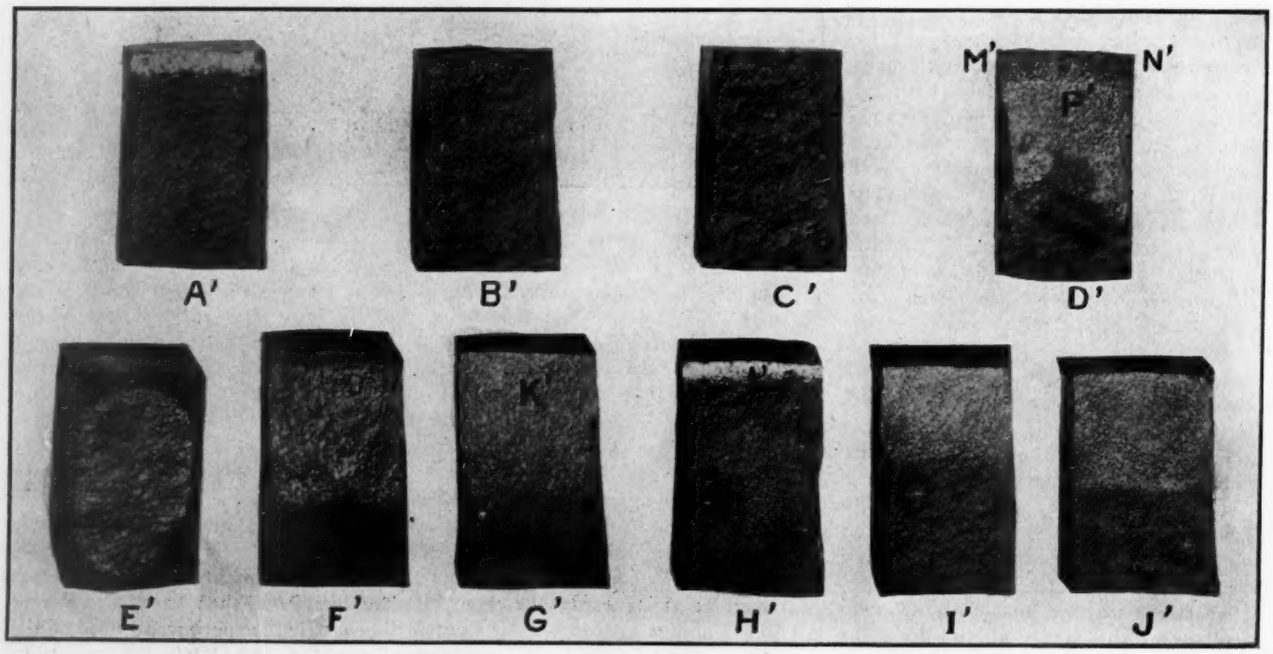


FIG. 1—CHILLED, NATURAL, MUD, WATER AND AIR-CHILLED TEST BARS

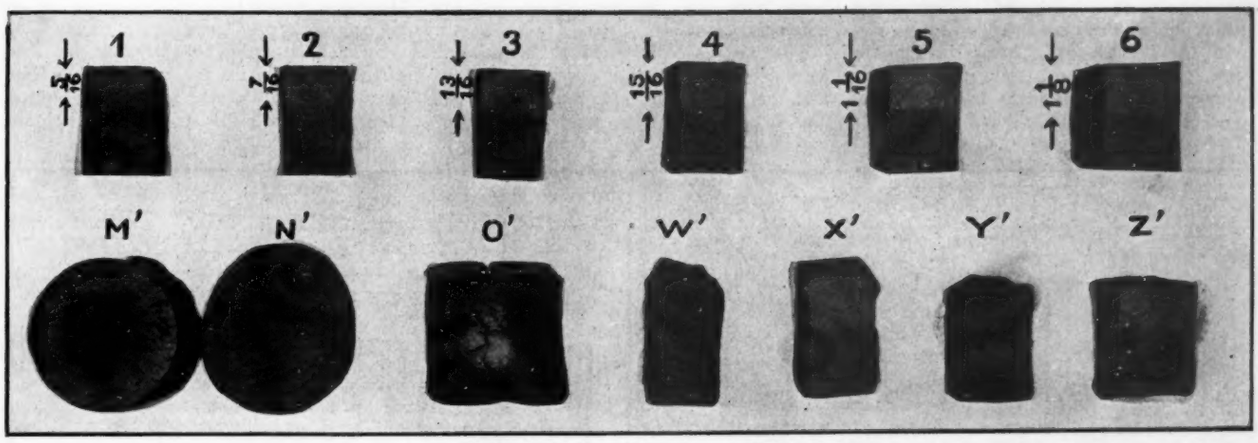


FIG. 2—THICKNESS OF CHILLER, INTERNAL CHILLING AND COOLING TEST BAR FRACTURES

this action any backward annealing to soften the chill is more or less retarded.

(b) Under like conditions, the lower the silicon and the higher the sulphur and carbon, the deeper the chill.

(c) Under like conditions, the chill will be deeper the smaller the area of the cross-section to be chilled.

(d) Under like conditions, the less the thickness in the chiller below what can be utilized, the less the chill in the casting.

(e) The longer the casting remains in close contact with its chiller while its metal is in a chillable state, the deeper the chill.

(f) The more fluid or the hotter the metal used in pouring a chiller mold, all other conditions being the same, the deeper the chill, from ⅛ to possibly ⅜ inch; and the greater the chillable nature of the metal, the more pronounced this effect.

(g) Not all grades of cast iron are chillable. It requires, as a rule, for iron of an ordinary carbon content, less than 2 per cent silicon and above 0.06 per cent sulphur.

(h) On account of the variable percentages of silicon, sulphur and carbon required to produce chilled castings, ranging from 1.75 down to 0.50 for silicon, from 0.10 down to 0.05 for sulphur, and from 4.00 down to 2.50 for carbon, it is evident that there must be what are commonly called *grades* in chillable irons.

Mold for Making Comparative Chilling Tests

In order to make comparative tests, a twin-chiller mold was designed, shown in Figs. 4, 5 and 15. By having the two molds combined so that they could be poured from the same basin, it was possible to make all the conditions alike in both, except the one which it was desired should vary for the particular test under way. The mold was further designed to produce conditions similar to those existing when casting chilled car wheels and rolls. In making these latter castings, the contraction of the chilled crust and the expansion of the chiller create a space between the exterior body of the casting and the interior face of the chiller. The ability to create a space in this experimental mold and to apply a heat-absorbing element to it in connection with other actions or treatment, referred to later, made it possible to conduct a large number of very satisfactory comparative tests.

In order to obtain a variable action so far as the chillers, *P*, Fig. 15, were concerned, the braces, *M*, were removed and the wedges, *N*, driven down. If it were desired to have the space, *K*, in both molds, two persons were employed to work in unison at the respective ends of the molds. The wedges, *N*, were not knocked down until the metal filling the mold showed evidence at the top edge of the bars of having solidified sufficiently to produce a self-sustaining crust. It was rather remarkable in the

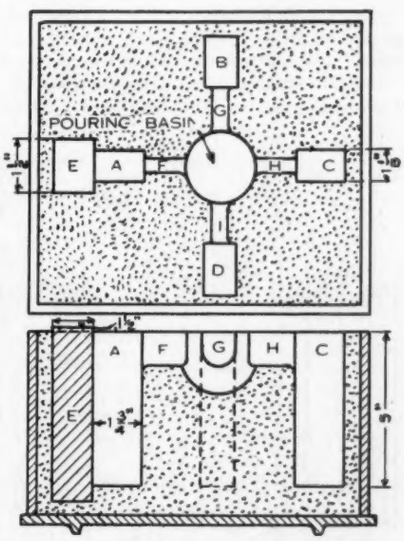


FIG. 3—MOLD FOR TEST BARS THAT SOLVED INSIDE CHILL PROBLEM

air-cooling tests, to be described later, how clearly the rate of cooling and inner solidification could be judged by the changing color of the hot metal at the top edge of the bars next to the chillers.

In casting bars intended to be kept in close contact with their chillers, either the runners connecting the pouring basin with the mold must be broken as soon as the metal in them has solidified sufficiently to permit such action; or care must be taken when pouring the molds not to fill them any higher than the level of the bottom of the pouring runners. By these means the disturbing influence due to the contraction of the runners and pouring basin is avoided.

Fig. 9, *A*, shows the form and size of the pattern used for molding the bars, while *B* is the manipulative chiller, *P*, Fig. 15, employed in these tests. Each of these chillers weighed 3 pounds, 14 ounces, and the bars made from the pattern, *A*, Fig. 9, averaged 3 pounds, 4 ounces.

In starting to use the twin chiller molds shown in Figs. 4, 5 and 15, the first manipulation was to draw back the chiller, *P*, Fig. 15, of one mold about ¼ inch from the face of its bar casting as soon as the latter had solidified sufficiently to have a self-supporting crust facing the chiller, while the companion bar was left in close contact with its chiller until of a dark color.

First Experiments

In various tests a ¼-inch space, *K*, Fig. 15, was formed by moving back the chiller, and the effect of quickly-packing different materials into this space upon the backward movement of the chiller was ascertained. The materials tried at different times were fine sand, coke dust, charcoal, powdered manganese, bone dust, hardening powder and potassium cyanide. These tests were made with a view of determining whether such filling of the space would increase the depth of chilling in a bar, or cause it to be any harder than when the chiller remained in close contact with the bar until the latter was nearly cold.

No noticeable effects were produced by the use of these intended hardeners. The thickness of chill of the bars kept in close contact with their chillers exceeded that of the treated bars by from ¼ to ⅜ inch. This was to be expected, as the withdrawal of the chillers, *P*, to create a packing space, broke the contact of the chillers with their bars at the crucial moment, so far as their ef-

fectiveness was concerned in increasing the depth of the chill.

In this series of tests, both chillers were pulled back at the same moment to create spaces adjacent to both bars, as at *K*, Fig. 15. The tests were made were both left in their molds to cool naturally.

The bar, *D'*, displayed an inside chill as shown by the white appearance at *P'* and the gray corners and surface at *M'* and *N'*. The best example of this effect, which was closely duplicated in several tests, is shown at *E'* in connection with the chiller-cooled companion bar, *F'*, which was cast against the face of the chiller, *E*, Fig. 3, the same as bar *A'* in Fig. 1. The bar, *F'*, showed that a harder grade of iron was used than for *A'*.

The writer's experience in producing this inside chill mechanically, demonstrates it to be a sensitive process partaking of numerous forms, yet all verifying its practicability. It is not improbable that castings, or sections of them, will eventually be produced in a regular manner for commercial use, having a gray or mottled exterior crust, while the adjoining or interior body of metal will be of a mottled, chilled or white iron. The writer can conceive of castings in which this combination of hardness might prove useful, but as his ideas might be considered visionary, he refrains from mentioning them.

Special attention was paid in this series of tests to the hardening effect of air applied directly to the hot chilled face of a bar. For tests of this character it is essential that the depth of chill in the comparative bars be of the same thickness. This condition was obtained by admitting the air to the treated bar only after it was thought the inner metal had all solidified, so that it could not be held responsible for any variation of depth of chill in the treated bars. Only three specimens of this series were tested by the scleroscope, as given in Table I; but from filing and grinding tests made as a check on the results it is evident that a chill's hardness can be very materially increased by applying air, etc.

Tests of the gray sides of the chilled bars for the second and third sets in Table I gave 52 and 42, respectively, showing them to average 25.4 softer than the chilled sides which had received the air treatment.

Another series of tests was conducted with a view to learning whether air saturated with water might be more effective than air alone in creating a chill, or in hardening. There was some difficulty at the start in obtaining satisfactory saturation, but this was finally secured by the use of a device which made it possible to vary the proportion of air or water, as desired. The tests were instructive in demonstrating that so far as the chilling was concerned there was little to be gained by the saturated air, or what was gained would be secured by the use of a greater volume of air alone, so that the water could be dispensed with. This is not, however, intended to reflect upon the effectiveness of saturated air as a hardening medium, for among the tests in which saturated air was strongly applied, one gave 70 for the treated bar, and 52 for the non-treated bar, a gain of 34.6 per cent due to hardening.

Specimens of this series of tests were cast in the twin chiller mold, as arranged in Fig. 5, without applying any air-cooling to either chillers. This gave the same depth of chill in both bars. Several sets were cast and an-

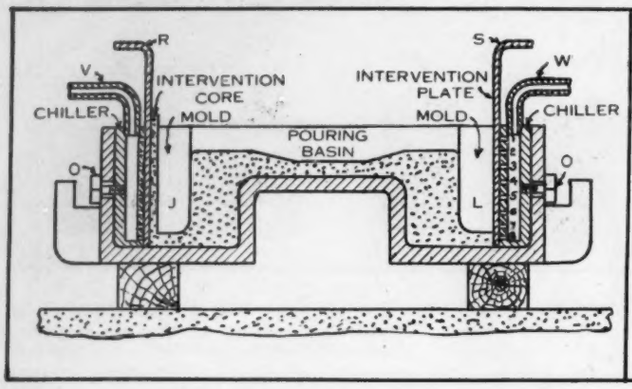


FIG. 4—INTERVENTION PLATE SYSTEM FOR AIR-COOLING AND CHILLING MOLTEN METAL

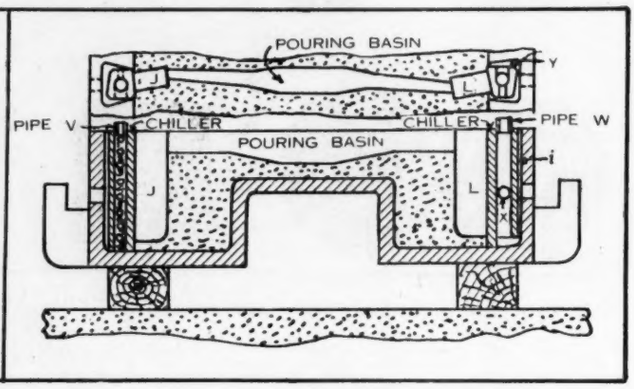


FIG. 5—CHILLER MOLD FOR TESTING CHILLING EFFECT ON CASTINGS BY COOLING CHILLER

to ascertain whether any greater depth of chill or hardening was produced by packing one of the spaces quickly with the materials used in the first experiments while the other space was left open. These tests showed the chill to be from 1/16 to ⅛ inch deeper in several of the treated bars than in the non-treated bars.

Tests for hardness, except for the cyanide, showed a gain of 6 to 10 per cent by the scleroscope. One cyanide test with companion all-chilled bars averaged 68 for the treated and 70 for the non-treated; while with another set of companion bars which were not chilled the non-treated bar gave 58 and the treated bar 50 on an average. This softening action of the cyanide may have been due to the fact that the bars were not cooled in water after treatment, as is necessary when case-hardening steel with cyanide. A peculiar effect of the cyanide is to produce a denser and a finer crystallization of the treated chilled face, about ⅛ inch thick.

Immersion Experiments

For this series, open sand molds, Fig. 3, were used, and by the aid of an assistant, two of the four bars were removed as soon as the crust solidification permitted. One of these bars was immersed and moved around in a pan of mud, which in some tests had salt mixed with it, while the second bar was simultaneously submerged in a pail of water. These tests were duplicated by having the pan nearly filled with a high fire-test oil in place of the mud. Tests made by the second use of the open sand mold, Fig. 3, showed that the mud or oil-cooling had little or no effect in chilling, on the average, while the water-cooling was radical in its action, *A'*, *B'*, *C'* and *D'*, Fig. 1, give a fair illustration of these tests; *A'* is the chiller-cooled bar; *B'*, the all-sand; *C'*, the mud-cooled bar, and *D'*, the one placed in water. Bars, *A'* and *D'*

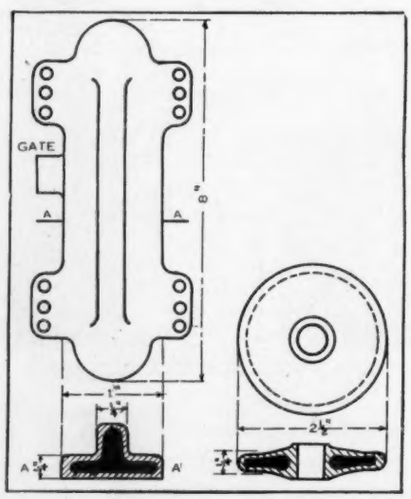


FIG. 6—CASTINGS WITH GRAY EXTERIOR AND CHILLED INTERIOR
Shaded Lines, Gray or Soft Iron; Black, White or Chilled Iron

nealed, but only one set was tested by the scleroscope. Other sets showed by filing and grinding that they checked closely those tested by the scleroscope. The annealing was done as follows: The bars were taken out of their mold together and one left in the open air, at about 70 degrees Fahr., while the other was laid on the bottom of a hot crucible furnace, the oil fire having been shut off, and left there about 12 hours. The chilled side of the unannealed bar tested at 68 and the gray side at 45. The chilled side of the annealed bar tested at 47 and the gray side 35. This gave a difference for the chilled sides of 21 and for the gray sides of 10.

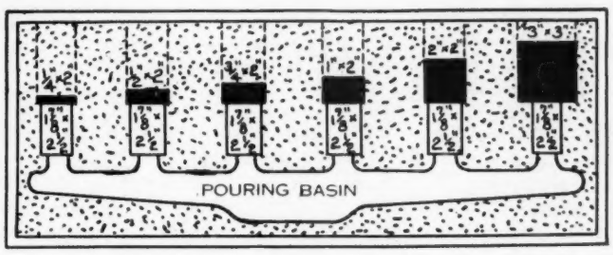


FIG. 7—TESTING EFFICIENCY OF DIFFERENT THICKNESSES OF CHILLERS

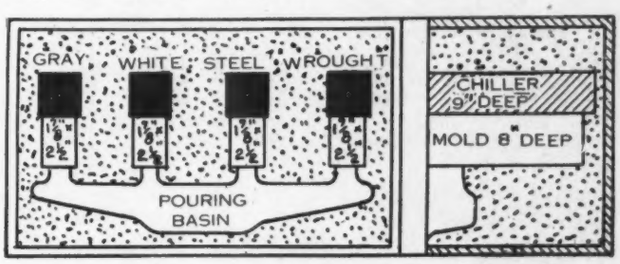


FIG. 8—TESTING EFFICIENCY OF DIFFERENT METALS FOR CHILLERS

In order to be assured of correctness in his researches, the author undertook to determine the efficiency of different metals, and of different thicknesses of metal, for chillers and the relative efficiency of warm and cold chillers.

To determine this, the latter two chillers, both alike, were used, one of which was heated to various temperatures, from one bearable to the hand to one that would burn the flesh, while the other chiller was kept at the temperature of the atmosphere. The first three sets of these tests were made on a day when the thermometer registered 62 degrees, and the second set of four tests when it was 55 degrees. The tests showed from 1/16 to 3/16 inch greater depth of chill in the bars having the cold chiller than those having the heated ones. Having recently read the claim that a warm chiller would chill deeper than a cold one, it was thought necessary to learn whether such was a fact, as it is unreasonable to expect such a result.

To determine the effect of different thicknesses for chillers, tests were made by the writer at the Cleveland plant of the National Car Wheel Co., as well as at the foundry of the West Steel Casting Co. For this series open sand molds were used, as shown in Fig. 7. The chillers were, respectively, ¼, ½, ¾, 1, 2 and 3 inches thick, and all were 2 inches wide by 9 inches deep.

The test specimens cast against these chillers in the wheel foundry were 1⅞ x 2½ inches and 8 inches long, and at the steel foundry, because of having a less chilling metal, they were of the size shown at *A*, Fig. 9. The top row of fracture views, Nos. 1 to 6, Fig. 2, is a fair representation of the results obtained. The thickness of chill in the samples shown in Fig. 2 is approximately as marked. A study of these samples demonstrates that the efficiency of chillers in general use is far from being in accord with their thickness. The 3-inch chiller, for example, produced only 3/16 inch more depth of chill than the 1-inch chiller.

Aside from their value in other ways, these tests suggest the advisability, to makers of chilled rolls, car wheels, etc., of trying steel chillers in place of the much heavier cast iron chillers. Steel chillers need be made only of the thickness required for efficiency in cooling and would still be strong enough to resist the contraction and expansion strains to which chillers are subjected. There is a liability of difficulty being encountered in using steel chillers on account of the steel warping, much more than cast iron, through repeated heating. By using ribs or giving a special form to steel chillers this objection may be greatly reduced, if not wholly overcome.

Efficiency of Different Metals for Chillers

It was important, at least to the writer, to know whether any difference existed in the efficiency of chillers of gray, white or all-chilled cast iron or of steel or wrought iron. Tests were made with these different metals at both foundries. Two tests of chillers were used, one 2 inches square and the other 1 x 2 inches, all approximately 9 inches long. Aside from grinding one face of these chillers to remove the scale and to make them smooth, as was done with all other chillers used in these experiments, they were chipped or ground at their lower ends, if needed, to make them all of the same weight. The plan of the open sand mold used is shown in Fig. 8. The test bar patterns were of the same size as used for the tests, Fig. 7, about four sets being cast from each size of pattern. While slight differences in the thicknesses of the chills resulting from chillers of the different materials seemed to indicate that one or another of the materials produced the deepest chill, there was so little practical difference in the results, taking an average of all the tests, that none of the chillers could be rated as being decidedly better than the others.

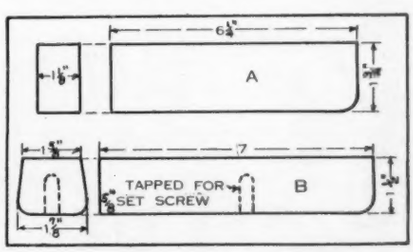


FIG. 9—FRACTURE TEST BAR PATTERN *A*; MANIPULATIVE CHILLER, *B*

The chief information sought in this series of tests was whether, when a casting contracts away from a chiller, the depth of chill is increased by cooling the chiller, and at what point the cooling ceases to have this effect. The chillers for these tests were arranged so as to have the orifices 1 to 8, Fig. 4, turned away from the face of the mold as in Fig. 5. This gave a solid surface to the body of the chiller fronting the mold, and prevented the air used to cool the chiller from impinging on the hot face of the bar. For the first tests, intervention plates, *S*, were used for fronting each chiller. As soon as the solidification of the metal at the face of these plates would permit, they were pulled out simultaneously to create a space between the bars and their chillers, as seen by the opening at *K*, Fig. 15. When the plates, *S*, were removed, air at about 50 pounds pressure was admitted to one of the pipes, as shown at *W*, Fig. 4, which passed down the bore of its chiller to find exit at *X*, and at the orifices *1* to *8* to the exterior of the chiller; then it passed upward and escaped to the atmosphere from around the opening, *Y*, shown in the plan view, Fig. 5.

In the use of chillers for car wheels, rolls, etc., the contraction of the casting and expansion of the chiller leave a space between the two, and these tests were, therefore, well-adapted to demonstrate whether internally or externally-cooled chillers used for this class of castings would produce a deeper chill than those not cooled. Six tests were made without finding any practical difference in the depth or character of the chill produced by the air-cooled chiller bars and that of their companions which were not cooled.

Following these tests, fully six more were made with the plates, *S*, omitted on both sides, so as to have the bars cast directly against the face of their chillers, as illustrated in Fig. 5. Here both bars remained in close contact with their chillers until cooled to a dark color. In casting these bars, air at about 50 pounds pressure was admitted to one side only, passing down the pipe, *W*, and escaping at the lower

exits, shown at *X*, then passing upward to the external atmosphere through the space, *I*. This method proved practically no more effective in increasing the depth of a chill than that just described, and appears to confirm the tests illustrated in Fig. 7, demonstrating that there is a limit to which the thickness of a chiller affects its efficiency. They forcibly illustrate the fact that it would be unreasonable to expect any benefit from a heat-absorbing medium passing rapidly through the internal body of a chiller or over its outer external surface, when a space existed between the casting and its chiller.

Chilling Produced by Sand-Faced Molds

It was desired to ascertain whether a chill could be created by air under pressure when prevented by a sand coating from getting directly at the hot surface of a casting. To test this, the methods illustrated in Figs. 4 and 10 were used, the two last of which were experimented with at both foundries. In using the mold shown in Fig. 4, an intervention core was employed, as seen at the left. This core was about ¼ inch thick and was well-wired so that the head pressure of the molten metal could not break it, when the plates, *R* and *S*, were pulled out together after pouring the molds. The first test of this series demonstrated the porosity of a sand mold's surface. Although this was a very hard core, the 50-pound air pressure used carried the air through it and would have blown all the metal out of its mold had not the valve been closed. The companion bar withstood the air pressure for the reason that the plate, *S*, had formed a chilled crust on the face of the metal in the mold before its removal. Further tests with

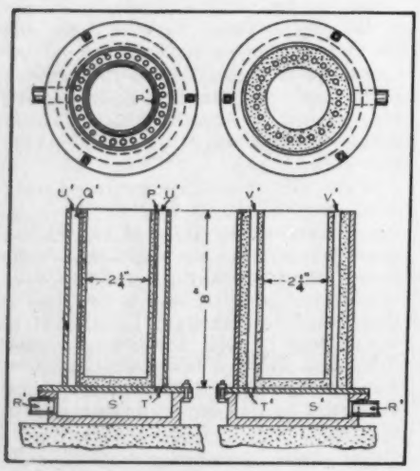


FIG. 10—PIPE SAND COATED, AIR-CHILLING MOLD AT LEFT, ALL SAND, AIR-COOLED MOLD AT RIGHT

these cores under different air pressures showed that the cores prevented any chilling action, while on the other hand the air was very effective on the opposite side.

The difficulty with this core method lies in the fact that air under sufficient pressure to penetrate the core and carry off heat and to create external chill will pass clear through the molten metal instead of forming a crust and then chilling it. This led to devising

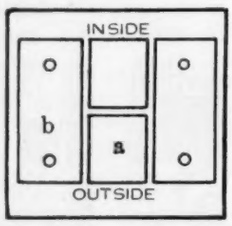


FIG. 11—FLOW OF HEAT RETARDED BY JOINTS

the method shown in Fig. 10. By a study of the sand-coated pipe, *P'*, it can be seen that any pressure up to 200 pounds and over can be employed without causing the air to impinge against the molten metal, while at the same time it can be more effective than the core itself in conveying heat to its outer surface and then to the atmosphere. The sand coating used on this pipe was only ⅛ inch thick and was thoroughly dried. To carry off the gases from the sand, the iron pipe was closely perforated with 3/32-inch holes as at *Q'*.

Air under 60 pounds pressure entered at *R'* to the chamber, *S'*, and passed up through the holes, *T'*, surrounding the pipe, *P'*. The air in the chamber, *U'*, was free to absorb heat from the pipe, *P'*, and to carry it rapidly to the atmosphere. The molds were poured without any cope or covering, care being taken to fill them only within ½ inch from their tops. In about 10 seconds after pouring the mold, the air was admitted and kept in action until after all the metal was thought to have solidified. A fair illustration of the results obtained is shown at *M'*, Fig. 2. An all-sand molded, non-treated companion bar was always cast from the same ladle that poured the treated bar. A sample of this is seen at *N'* at the right of *M'*.

There is little doubt but that the pipe, *P'*, acted as a chilling agent without the use of air, as there was only ⅛ inch thickness of sand between it and the face of the casting. In fact, a test made without the air showed that the pipe aided the chilling, since it gave a density to the crust of the casting. Again it is to be kept in mind that as the diameter of the casting was only 2¼ inches, its contraction would not be sufficient to create a visible space between its outer body and the face of the mold, as is generally created in casting chilled rolls, car wheels, etc.

In the all-sand mold, *Y*, Fig. 10, which was also tried, the air passed up through holes, *T'*, which were ¼ inch in diameter and about the same distance apart, all around the circumference, as shown in the plan view. The air escaped freely around the top at *V'*. The holes, *T'*, had only about 3/16 inch thickness of sand between their inner exterior and the face of the mold. Castings produced by this method showed a dense exterior or crust of from ⅛ to ⅜ inch thick, and in some instances were slightly mottled. Only in one case was there any display of chill, and this was of an irregular character, ⅛ to ¼ inch thick, created inside of a gray crust, about ⅛ inch thick. In reality, this was an example of inside chill, one of the factors sought in these experiments being to learn if by such methods it could be produced at will and if it was controllable.

It was intended also to form holes as at *V'* with very thin pipes drilled closely full of 3/16-inch holes, and if a steady pressure of 100 to 150 pounds of air could have been secured, further efforts to learn the practicability of obtaining an inside chill with such, or similar, methods would have been tried.

A study of the principle embodied in Figs. 4 and 10 will suggest ideas and ways and means by which grades of soft iron, aside from chilling iron, can be made more dense or crust-hardened; also by which castings or sections of castings may be cooled to prevent contraction cracks and shrink holes.

Effect of a Joint on Transmission of Heat

It is evident that in constructing chillers to be cooled by air, etc., sufficient consideration has not been given to the question of transmission of heat. An excellent article by Carl Hering on "The Flow of Heat Through Furnace Walls"[1] might be read with advantage in connection with this paper. Its author offers among other features the illustration shown in Fig. 11, with the following comments:

"Moreover, the writer noticed recently

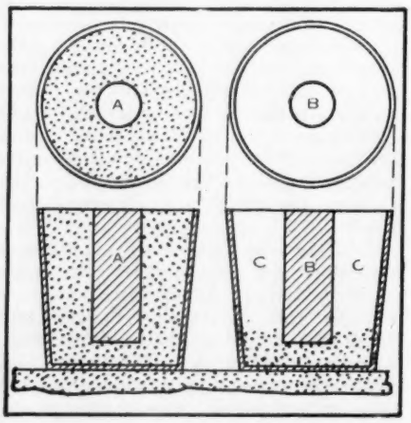


FIG. 12 — TEST BAR CAST IN OPEN SAND AND LATER FREED OF SAND AND SURROUNDED BY WATER

in an electric furnace that the temperature of the brick at *a* in the sketch was considerably cooler than at *b*, the difference was so great that it was easily noticeable to the touch. This was

[1] *Metallurgical and Chemical Engineering*, September, 1911.

no doubt due to the joint which separated the one from the inside of the furnace."

The principle illustrated in Fig. 11 is similar to that involved where such spaces exist as at *K*, Fig. 15, which greatly retard the absorption by the chiller of heat from the castings. It all emphasizes the utility of filling such a space as *K* with a heat-absorbing medium that can be moved swiftly from an inlet to an outlet to carry off heat for cooling, hardening or chilling purposes.

It is believed that a study of the conditions will show that a rapid passage of air or other heat-absorbing media through a space as at *K*, Fig. 15, or over the surface of a casting, is very efficient for the purpose of extracting and conveying heat quickly both from the face and adjoining body of a hot casting.

Heat Conductivity of Sand, Iron and Air

These tests were made for the purpose of ascertaining the heat conductivity of molds, composed of a sand body, and again of iron, as in chillers, instead of having a heat-absorbing medium impinge directly against the hot surface of a casting with exits for the rapid escape of the medium to the atmosphere. The tests for sand conductivity were made by constructing a dry sand core, 1½ inches square by 7½ inches long, with a ⅝-inch port hole lengthwise through the center. This core had part of the outer face of one end cut away to provide an exit for the air forced through the interior of the core. When placed in position, the core appeared practically like the chiller, shown at the right, Fig. 5. The tests for iron conductivity were made by having a chiller with a solid face and other conditions of its position, shown at the right, Fig. 5.

In conducting these tests for the sand and iron, as well as with air impinging against the surface of the hot castings, only one end of the flask for twin molds was used. The mold, *L*, was formed with the same pattern, *A*, Fig. 6, which was used for making all other bars. The molds were poured by a direct flow of the metal from the lip of the ladle. The top of the bars having been covered with sand and a plate to confine their heat so that the thermometer used would read correctly, the air-flow was started down the interior of the core or chiller and found an escape at the opening, *X*, and up the sides, *I*, to the top around *Y*, thence to the atmosphere, as shown at the right, Fig. 5.

Table I.

SCLEROSCOPE TESTS FOR HARDNESS[2]

Set Number of Tests.	Set 1	Set 2	Set 3
Average of air-cooled chilled bars	56	65	61
Average of natural-cooled chilled bars	48	58	53
Average of increase in hardness effected	8	7	8

To obtain the temperature of the escaping air, the bulb of a thermometer capable of registering 500 degrees was held directly above and resting on the

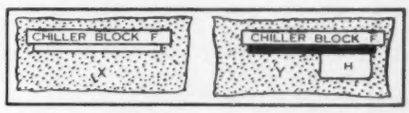


FIG. 13 — MOLD FOR CASTING A CHILLED PLATE AT *X*; *Y*, MOLD WITH SPACE, *H* FOR MOLTEN METAL

surrounding sides of the open space at *Y*. An assistant recorded the time and the varying temperatures of the escaping air at the first 15 and 30 seconds and afterwards each minute, as indicated in Table II. At the end of 10 minutes the bulb of the thermometer was held at one end of the inlet pipe after it was disconnected in order to obtain the record, *4*, in Table II. At the end of 2 minutes, and after the plate and sand had been removed from the top of the bar, the bulb of the thermometer was placed so that its frame end rested on the middle of the top end of the bar for 3 minutes, that the natural radiation of heat from the bar, record *17*, Table II, might be recorded. The variations in pressures and temperatures, records *3* and *4*, are due to changes in the speed of the compressors and to the amount of air being taken from the tank for other purposes. The apparent inconsistency of the temperature dropping at the start to only 80 degrees and 94 degrees, while that which came from the tank of the compressors is 134 degrees and 124 degrees, as in record 4, is due to the temperature of the core and chiller at the start, being that of the atmosphere, as shown in record *2*. For these reasons, the in-going air is for a few moments reduced in temperature.

A study of Table II shows the sand to be the least effective as a conductor of heat, while the iron is not very much better when compared to the conductive power of air applied directly to the surface of the hot bar, as recorded in *17*, Table II, where it is seen that from the moment the air impinged upon the surface of the hot bars its temperature rose and in less than 30 seconds after the mold was poured it reached 200 degrees.

Experiments Upon Direct Application of Heat-Absorbing Media

The following experiments were largely responsible for patents granted May, 1912, and pending, covering direct-cooling and treatment processes by pressure or suction for chilling, hardening and relieving internal strains in castings, etc. These are to be utilized wherever a space can be formed adjacent to a casting, either artificially or by the natural expansion of the chiller and contraction of the casting, also when the hot surface of a casting is freely exposed to the atmosphere or not surrounded by its chiller.

Two twin molds were used for the experiments, each having intervention plates placed as at *S*, Fig. 4. After the two molds were poured from the same pouring basin, and a crust was formed on the face of the bars, the two plates were quickly and simultaneously removed from the mold, forming spaces, *K*, Fig. 15. For the first experiments air at 20 pounds to 30 pounds pressure was admitted to one of the pipes, *W*, Fig. 4, and conveyed directly to the space created by the removal of the plates, *S*, through orifices *1* to *8* in the bore of the chiller. The fast darkening of the top edge of the face of the treated bar, compared with that of the companion bar which was cooling naturally, gave good reason to expect considerable difference in the depth of chill and in the density or hardness of the chilled face of the two bars. The intervention plates, *S*, were 2 inches wide by ⅛ inch thick. A slight coating of oil was given the faces of these plates next to the bars to prevent their uniting with the metal, and to permit their being drawn out of the mold quickly at the right moment.

Experiments with Cooled Air

Experiments were further made with air cooled by passing through a pipe coil surrounded by a mixture of two parts of cracked ice and one part of salt. The temperature was reduced thereby from 85 to 45 degrees, but no greater chilling effect was discovered in the six tests conducted on this plan than in the first series with the air as it came from the tanks. This is, as would be expected, since the reduction of the temperature of the air by 40 degrees is small in amount compared with the temperature of 2,000 degrees, which it may be assumed the surface of the molten bar would have. An increase in the pressure or volume of the air would easily discount all that could be accomplished by lowering the temperature of the air to 40 degrees.

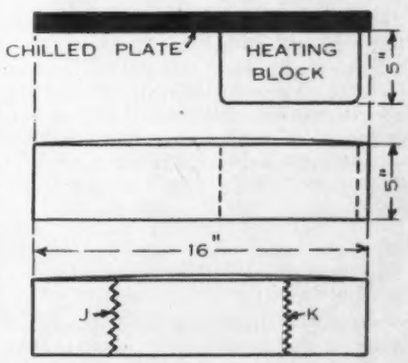


FIG. 14—CHILLED PLATE, WITH HEATING BLOCK ATTACHED, AND SEPARATED CASTING

Tests also were conducted with air at higher pressures. At 50 pounds

[2]The writer is indebted to the Cleveland Punch & Shear Works, Cleveland, for these scleroscope tests.

pressure a chill was created for a depth of 1⅛ inches in the air-cooled bar, whereas the naturally cooled bar had a depth of chill of only ⅛ inch, as shown

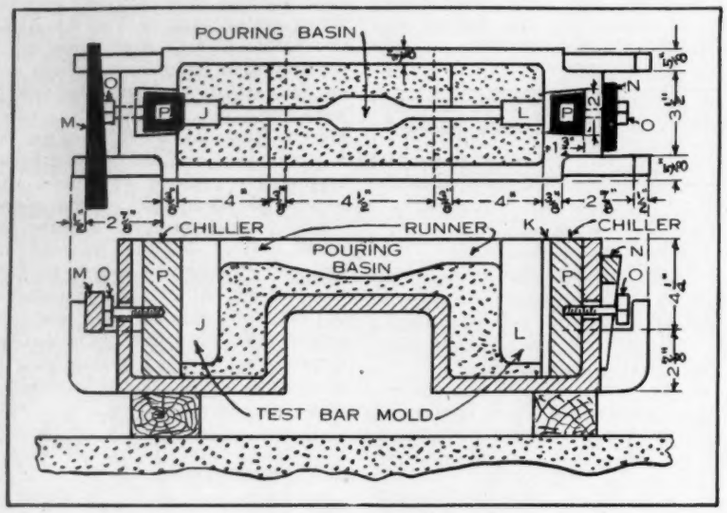


FIG. 15—MOLDS FOR MAKING CHILLED TWIN SPECIMENS FOR FRACTURE TESTS

respectively at *K'* and *L'* in the bars, *G'* and *H'*, Fig. 1. The gray body of both of these bars displayed a fine texture bordering on a mottled state. This test removed every possible doubt of the efficiency of air-cooling for chilling. Half a dozen or more of these tests were made before taking up others, and they all verified the results of the first tests.

Later, tests of the same character were conducted by having titanium and vanadium in the metal. Two sets of these samples are shown at *W'*, *X'*, *Y'* and *Z'*, Fig. 2. Here, as in *G'* and *H'*, Fig. 1, the air was by far the most effective in chilling. The air-treated bars showed about ⅞-inch depth of chill whereas their companions had only about ⅛-inch chill.

In line with these tests, a series was made to determine whether air chilling was more effective than chilling by means of a solid chiller held in close contact with its bars. Samples of bars contrasting these two methods are shown at *I'* and *J'*, Fig. 1, the air-cooled bar at *J'* having ¾-inch chill, while the other at *I'*, produced by the close contact chiller bar, has .9/16-inch chill.

Chilling of iron must be accomplished prior to the formation of graphite, and with like irons the quicker and more penetrating the cooling action, the deeper and harder the chill. The direct application of a heat-absorbing medium to the surface of a hot casting, as soon as contact with its chiller is broken, or a crust is formed, provides means at a critical moment which cannot but be of material benefit in increasing the utility of cooling, densifying or chilling and hardening of chillable and other grades of cast iron. It also provides means for using a softer, lower chilling and a stronger iron in car wheels, etc., obtaining at the same time the desired depth of chill.

It always has been believed that in chilling iron, the action ceased the moment the molten metal solidified. The writer's recent experiments show that such is not the case, but that with chillable iron there exists a period of 20 to 30 seconds or more when iron can be chilled, after the formation of a crust before any graphite is separated out. This was demonstrated as follows: At *A*, Fig. 12, is shown a casting poured in open sand, while at *B* it has been freed of its sand, this being done about 2½ minutes after the casting was poured. Space, *C*, was filled immediately with cold water, kept running until the casting was cold.

Upon breaking the specimen it was found, if of a high chilling iron, to be a homogeneous body of all chilled or white iron with a discolored or reddish center. But if, instead of surrounding the specimen with water at the expiration of 2½ minutes, there were allowed to lapse 3 to 3½ minutes before doing so, the crust exhibited graphitic formation, while the interior body was found to exist in a mottled or all-white state, showing the inside chill to have been created.

These tests indicate the existence of two laws positive in their action, as follows: First, cooling or chilling is effective in creating or continuing a chill in a casting for a period of 20 to 30 seconds after its molten metal has solidified. This permits a continuation of chilling with castings like rolls and car wheels which break contact with their chillers immediately after the formation of their chilled crust. Second, graphitization having once taken place in the crust or body of a hot casting, no sudden cooling can restore the carbon to its original combined form, and only by remelting can it be so transformed as to have a chilled or white iron structure.

With chillable irons any founder can produce a casting having an outside chill with a gray interior, but to produce one having a gray exterior and inside chill, or white body, is another proposition. Mention has already been made of the sensitive nature of this accomplishment. The variable conditions that must be considered and accurately controlled to create a perfect inside chill are as follows: (a) Temperature of the pouring metal; (b) temper of the sand; (c) atmospheric conditions; (d) nature of the iron; (e) size of the specimen; (f) temperature of the water; (g) whether the specimen remains stationary in its mold to be cooled or is removed or moved about in a body of water.

When it is realized that, for example, with the size of a specimen shown in Fig. 3, there are only some 5 to 10 seconds in one minute when the perfect inside chill can be created, all students of this problem will realize that at present it is a hit-and-miss process. The writer has deemed it necessary to give all the above facts, so that anyone undertaking to produce an inside or internal chill will not be led to affirm it an impractical achievement. It will be well to state that the writer is of the opinion, that when one can obtain a medium chilling iron in place of the

Table II.

TEMPERATURE TESTS MADE OF THREE CASTS, OCT. 23, 1911

Record No.		Sand Core.	Chiller.	Face of bar.
1	Body cooled with air			
2	Temperature of atmosphere, degrees Fahr.	52	52	52
3	Pressure of air used, pounds	55	50	50
4	Temperature of tank air, degrees Fahr.	134	124	130
5	Temperature escaping air at 15 seconds	80	94	...
6	Temperature escaping air at 30 seconds, degrees Fahr.	100	112	200
7	Temperature escaping air at 60 seconds, degrees Fahr.	116	142	290
8	Temperature escaping air at 2 minutes, degrees Fahr.	120	162	310
9	Temperature escaping air at 3 minutes, degrees Fahr.	126	182	290
10	Temperature escaping air at 4 minutes degrees Fahr.	130	182	270
11	Temperature escaping air at 5 minutes, degrees Fahr.	134	178	264
12	Temperature escaping air at 6 minutes, degrees Fahr.	136	176	252
13	Temperature escaping air at 7 minutes, degrees Fahr.	138	172	236
14	Temperature escaping air at 8 minutes, degrees Fahr.	140	170	222
15	Temperature escaping air at 9 minutes, degrees Fahr.	140	166	200
16	Temperature escaping air at 10 minutes. degrees Fahr.	138	162	192
17	Heat radiated from the bars 15 minutes after they were poured, degrees Fahr.	208	172	70

extremes, such will be best for creating an internal chill.

Internal Chilling Tests with High Silicon and Soft Casting Mixtures

Tests made by the writer, assisted by W. J. Strangward, superintendent, at the Forest City Foundry & Mfg. Co., Cleveland, showed that the high silicon in this company's light work mixtures caused graphitization to take place almost immediately, if not at the moment, of solidification, as the specimens exhibited no white or even mottled internal structure in any of the tests. Other tests made at the Madison Foundry Co., Cleveland, upon supposed non-chilling mixtures with silicon around 2 per cent and sulphur under 0.08 showed that these percentages of silicon and sulphur marked the division between chilling and non-chilling irons of the usual good working grade of foundry mixtures. The tests showed that if internal chilling could be produced with mixtures having from 2 to around 3 per cent silicon, there was a possibility that something was wrong with the physical or the chemical properties of the mixtures.

A feature of these tests with soft irons was that they showed a swelling in place of a shrinkage in their tops; also a greater fluidity of metal, or length of time before solidification took place. Although these bars were only about 1½ inches in diameter, they remained in a liquid state about as long as specimens 2¼ inches in diameter cast of the chillable car wheel metal.

Founders and engineers interested in castings for machining, etc., might often utilize internal chilling tests to advantage, as a means of determining whether there is anything in the chemical or physical properties of mixtures likely to cause chilled edges, hard spots, etc., instead of waiting for this to be found out in the machine shop. The writer suggests as a standard for such tests, bars 1½ inches in diameter and 6 to 8 inches long for mixtures ranging from 1.25 to 3.5 per cent silicon and bars 2.4 inches in diameter and of similar length, for mixtures having from 0.5 to 1.25 per cent silicon. In making internal chilling tests, care must be exercised not to immerse a specimen in water until a self-supporting crust has been formed, or an explosion of liquid metal may occur. The use of a fair amount of intelligence and caution will guard against such dangers.

Being desirous of knowing whether, after the greatest depth of a chill is created, it is possible for the intense heat of an internal body of semi-molten or solid metal to decrease the depth of a chill by graphitization, or drawing the chill, the writer conducted the following experiments: An open sand mold having a chiller block, *F*, was used, as shown at *X*, Fig. 13. The open sand mold was formed by plate patterns, ⅝ and ⅞ inch, respectively, both being about 5 inches deep and 16 inches long. After the plates were poured and solidified, a space was dug out for about half their length, as seen at *H*, Fig. 13, *Y*. This space was filled with molten metal, left in close contact with the chilled plates until cooled to a dark color. The molten metal was of regular car wheel mixture, and the tests were conducted at the National Car Wheel Co.'s plant.

Tests were made with the plates at different temperatures from that at which the molten metal would fuse the face of the plate, down to temperatures at which the plates were of a dark color. Upon removing these plates and body blocks of metal from the molds, the chilled plates would be separated from the blocks of metal and broken at about the points, *J* and *K*, Fig. 14, to display any contrast that might exist due to the treatment. Only in one case was the plate inseparable, and in this instance the plate and block were broken by a heavy drop block.

In all of these experiments a drawing of the chill in depth was displayed by reason of the hot molten metal causing a graphitization of the chilled face abutting it. The experiments made with the hottest plates showed the greatest effect, and such as to produce about a 25 per cent graphitization of the chilled plates face that abutted the hot metal. This effect was exhibited by a fairly uniform decrease of the graphitization down to the coldest plates, which showed but a slight effect of the treatment.

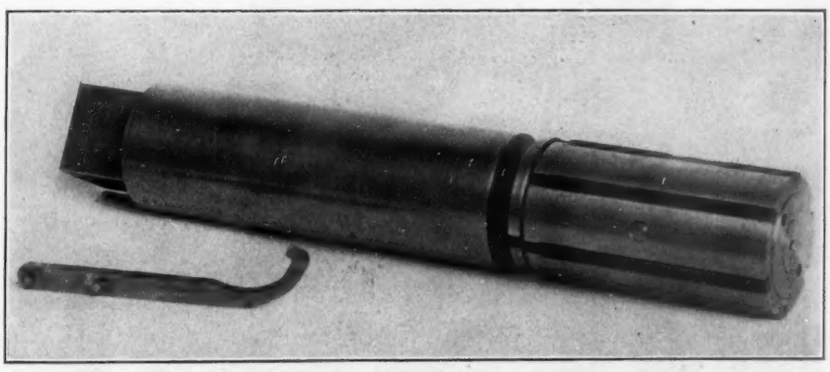


FIG. 1—ADJUSTABLE REAMER ASSEMBLED

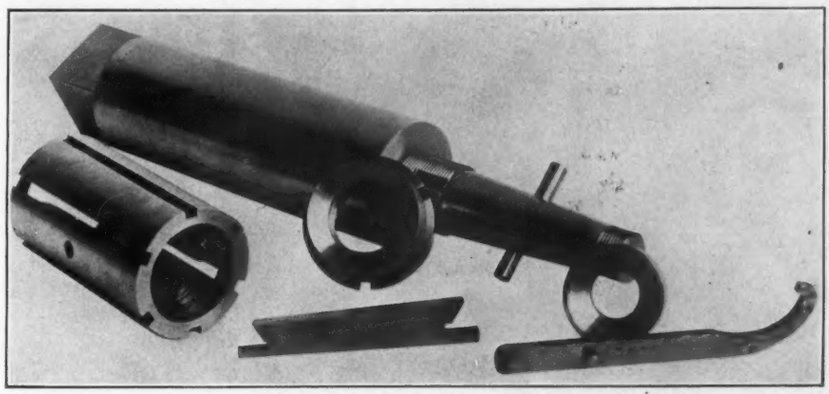


FIG. 2—VARIOUS PARTS OF ADJUSTABLE REAMER

Adjustable Precision Reamer

In the accompanying illustration is shown an adjustable precision reamer, manufactured by the Cincinnati Precision Lathe Co., Cincinnati. It consists of a slotted steel shell which fits over a tapered shank and is held in position by tapered pins. As the shell is slotted through its thickness with the exception of the ends, the cutting blades rest directly upon the tapered shank. The shank is threaded at each end for the adjustment of angle collars which retain and adjust the blades by their up or down movement on the shank. The shank is accurately tapered and ground and as the blades are jig ground, a uniform adjustment of all the blades is assured. By reversing the adjusting collar next to the body of the reamer and following with the adjusting collar at the end of the shank, the blades are moved up the tapered body uniformly and cannot become eccentric to the body of the reamer. The blades are firmly clamped to the shank by a 30-degree angle in the collars which engages the ends of the blades. The reamer is so constructed that all parts are protected from the cuttings. One combination wrench is used for all adjustments. In Fig. 1 the reamer is shown assembled and Fig. 2 clearly illustrates the shank, steel shell collars and one of the blades.

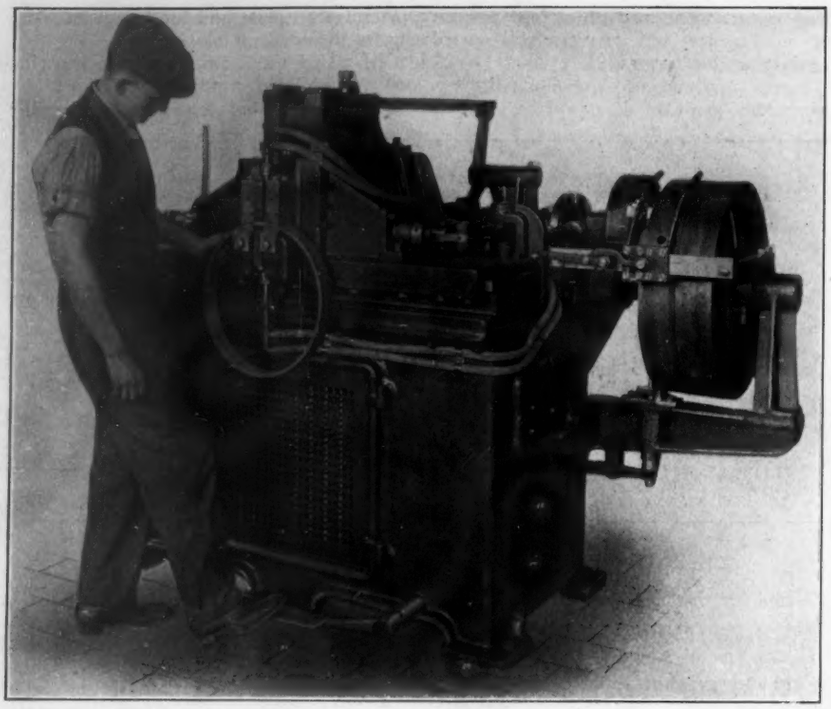


FIG. 1—NEW ELECTRIC TIRE WELDING MACHINE

Electric Welding Machines

Two new types of electric welding machines, designed respectively for welding tires and for spot welding, are now being built by the Toledo Electric Welder Co., Cincinnati. The welding machine for flat tires is illustrated in Fig. 1 and the spot welding machine is shown in Fig. 2. The machine for welding flat tires has a capacity for material from ¼ x ¾ inch to ⅜ x 1¾ inches and ¼ x 2 inches. A tire ¼ x 1¼ inches can be welded in 13 seconds and from 1,800 to 2,000 tires can be welded in 10 hours. The welding machine is operated by alternating current and the machine can be arranged for any standard voltage from 110 to 550. A special transformer in the base of the welder reduces the current to from 3 to 5 volts. This low voltage makes the machine absolutely safe and the operator cannot be shocked under any condition. The current is controlled by a regulator which permits the operator to vary the heat according to the size of the stock to be welded. The dies are water-cooled by means of a ½-inch pipe. The flow of water is reduced by a valve to the small amount required to cool the dies. The dies can be adjusted to varying pressures according to the size of stock that is being welded.

When welding tires by hand, it is necessary to heat the stock in a furnace and to hammer or press the two ends together to form the weld. By the use of the electric welder, however, the tire is placed in the jaws of the welding machine, as shown in Fig. 1. The front lever is actuated and the clamping jaws grip the tire and bring the ends together. The current is turned on automatically and in a few seconds the ends of the tire are raised to a welding temperature. When the ends of the tire have reached the proper welding temperature, the foot lever is again depressed, the current is turned off automatically and the ends of the stock are forced together. At the same time two steel dies located between the clamping jaws reduce the fin or projection on the weld, leaving the welded section practically the same thickness as the balance of the stock. This eliminates the subsequent grinding of the weld. At the end of this second operation the clamping dies open automatically, the tire is removed and the next tire is inserted by the operator.

In Fig. 2 is shown a new spot welding machine. It is operated by a variable speed motor and welds can be made at the rate of 80 to 150 per minute. The machine operates on the same principle as a punching machine. By depressing a treadle the machine is placed in operation and when the pressure is released the machine stops and the dies open, ready for making the next weld. Any number of spot welds can be made while the dies are in operation. When the dies grip the stock the current is turned on to make the weld. When the melted metal is forced together the current is turned off, being automatically controlled, and there is no possibility of drawing an arc and burning the stock when the die points are separated. Notwithstanding the speed with which the work is done, the welds unite the parts so firmly that the steel will tear away from the welded section when an attempt is made to pull the sheets apart. In the manufacture of sheet steel tool boxes, it is claimed that one boy with a welding machine can do the work of nine men when riveting the stock. Similar economies have been effected in other lines of work with electric welding machines.

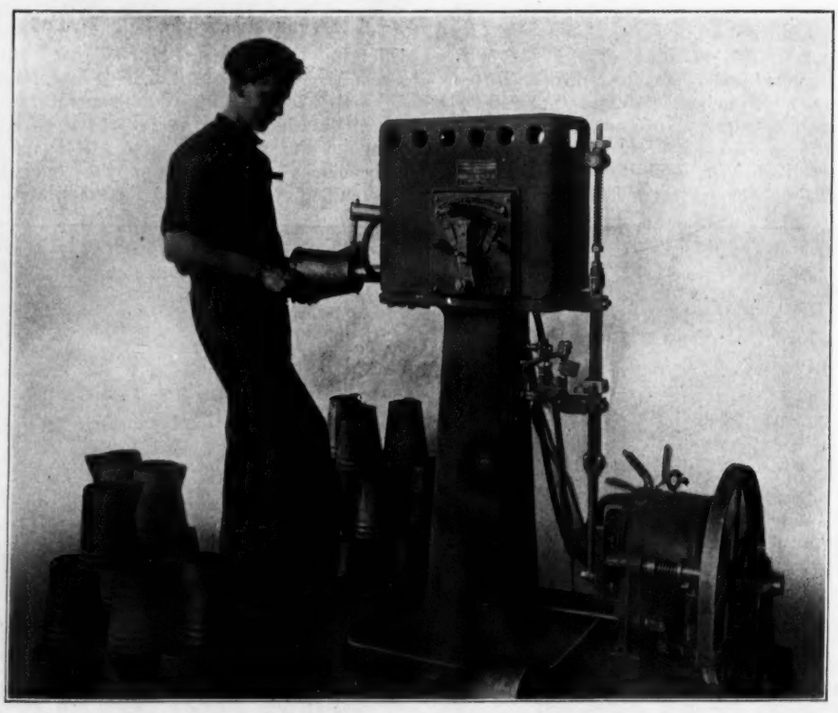


FIG. 2—NEW ELECTRIC SPOT WELDING MACHINE

Iron and Steel Securities

In spite of the political unrest, an upward tendency of security prices was displayed on the stock exchange last week. Developments at the Chicago convention restricted activities, but failed to definitely influence prices, stocks holding firm. There was an undertone of strength throughout the list.

Monday, the prices were steady and averaged higher for the prominent stocks. The majority of the business was handled in the final hour, following a dull day. Crop news was favorable and foreign markets irregular. Tuesday, market extremely dull. English consols fell to 76 1/16, the lowest price since 1888. Copper advanced to 17 5/6 cents. Wednesday, stocks were more active and prices higher with copper stocks leading. English consols fell to 75⅞, the lowest price since 1831. Thursday, the market displayed activity and on heavy sales, prices rallied sharply and closed firm. Wheat market firm and higher. Foreign markets generally dull and heavy. Friday, stocks relapsed into dullness, with the tone steady. Industrials reached the highest average level of the year. Copper reached 17¾ cents, the highest in five years. Saturday, sales were few and price changes insignificant.

Money on call ranged between 3 and 2 per cent. Time money was not especially active. The actual condition of clearing house institutions showed loans decreased $11,766,000; net deposits decreased $526,000; total reserve $465,953,000, and the excess of reserve $29,267,850, an increase of $32,800. Non-member banks and trust companies showed loans decreased $1,225,000; net deposits decreased $603,300; reserve on deposits decreased $140,200, and the percentage of reserve 19.2, unchanged from the week previous. Bank clearings showed a decrease of 6 per cent from the preceding week and an increase of 4 per cent over the corresponding week last year. Commercial failures numbered 253, compared with 233 the preceding week and 215 the corresponding week last year. Shares were sold to the number of 1,265,738, compared with 1,758,460 the preceding week and 1,767,645 the corresponding week a year ago. Bonds, exclusive of government bonds, were sold to the amount of $11,707,000, compared with $8,483,000 the preceding week and $13,369,000 the corresponding week a year ago.

	Clos'g Quo. June 22	Changes in week.	Annual Meeting date 1912	Stock Outstanding	Basis.	Dividend Last Dividend	Dividend Date Last Div. Pay
Allis-Chalmers	¾	.....		$19,820,000		.....	
Allis-Chalmers, pr.	2½	+ ½		16,050,000	7 cum.	1¾ Q.	Feb., 1904
American Can	37	+4¼	Feb. 6	41,233,300		.....	
American Can, pr.	117½	+1½		41,233,300	7 cum.	1¾ Q.	July, 1912
Am. Car & Fdy.	59½	+ ¾	June 27	30,000,000	2	½ Q.	July, 1912
Am. Car & Fdy., pr.	118⅜	+ ⅜		30,000,000	7 n. c.	1¾ Q.	July, 1912
American Loc.	42½	+1¼	Oct. 15	25,000,000	5	1¼ Q.	Aug., 1908
American Loc., pr.	108¼	.....		25,000,000	7 cum.	1¾ Q.	Apr., 1912
American Ship.	50⅞	.....	Oct. 9	7,600,000	4	2 Q.**	June, 1911
American Ship, pr.	101	.....		7,900,000	7 n. c.	1¾ Q.	Apr., 1912
Am. Steel Foundries	37	.....	Mar. 21	17,184,000	5	1¼ Q.	May, 1911
Barney & Smith	10	.....	June 4	2,000,000	4	1 Q.	Dec., 1907
Barney & Smith, pr.	70	—5		2,500,000	8 cum.	2 Q.	Dec., 1911
Bethlehem Steel	37	+ ⅞	April 2	14,862,000		.....	
Bethlehem Steel, pr.	69½	.....		14,908,300	7 n. c.	¾ Q.	Feb., 1907
Cambria Steel	43⅜	+ ¼	Mar. 19	45,000,000*	5	1¼ Q.	May, 1912
Cambria Iron	43	.....		8,468,000*	4	2 S. A.	Apr., 1912
Chicago Pneumatic Tool	48¾	.....	Feb. 19	6,448,800	4	1 Q.	Apr., 1912
Colorado Fuel	32¼	+ ¼	Oct. 21	34,235,500		1¼ Q.	Apr., 1902
Crucible Steel	14¼	+ ½	Nov. 15	24,578,400		.....	
Crucible Steel, pr.	89½	+ ¾		25,000,000	7 cum	1¾ Q.	June, 1912
Empire Steel	5	.....	Feb. 28	1,254,770		.....	
Empire Steel, pr.	41	—4		2,500,000	6 cum.	2 S. A.	July, 1911
Fay & Egan	75	.....	Feb. 20	1,000,000	7	1¾ Q.	Nov., 1908
Fay & Egan, pr.	115	.....		1,000,000	7 cum.	1¾ Q.	May, 1912
General Electric	172½	+3⅛	May 14	77,281,200	8	2 Q.	July, 1912
Harbison-Walker	39	.....	Jan. 15	18,000,000	2	½ Q.	Mar., 1912
Harbison-Walker, pr.	100	—1		9,600,000	6 cum.	1½ Q.	Apr., 1912
International Pump.	25⅜	+ ⅜	Dec. 13	17,762,500		½ Q.	Apr., 1905
International Pump, pr.	80	+ ⅛		11,350,000	6 cum.	1½ Q.	May, 1912
Lackawanna Steel	35	.....	Mar. 13	34,978,000		.....	
Lake Sup. Corp.	29½	— ½	Oct. 2	40,000,000		.....	
New York Air Brake	72½	—2	Mar. 13	10,000,000	6	1½ Q.	July, 1911
Niles-Bement-Pond	95	.....	Feb. 7	8,500,000	6	1½ Q.	June, 1912
Niles-Bement-Pond, pr.	101	.....		2,000,000	6 cum.	1½ Q.	May, 1912
Otis-Elevator Co.	76	.....	Mar. 18	6,358,600	4	1 Q.	July, 1912
Otis Elevator Co., pr.	100	.....		6,375,300	6 n. c.	1½ Q.	July, 1912
Pa. Steel	60	.....	May 13	10,750,000		.....	
Pa. Steel, pr.	99⅞	+ ⅛		20,587,500	7 n. c.	3½ S. A.	May, 1912
Pittsburgh Coal	21¾	+ ¾	Mar. 12	28,134,600		.....	
Pittsburgh Coal, pr.	91¼	+1¼		27,071,800	7 cum.	1¼ Q.	Apr., 1912
Pittsburgh Steel Co., pr.	101½	.....	Oct. 7	7,000,000	7 cum.	1¾ Q.	June, 1912
Pressed Steel Car	35⅞	+1⅜	Feb. 21	12,500,000		1 Q.	Aug., 1904
Pressed Steel Car, pr.	101	.....		12,500,000	7 n. c.	1¾ Q.	May, 1912
Pullman	161¼	+1¼	Nov. 13	120,000,000	8	2 Q.	May, 1912
Railway Stl. Spring	36	+ ¾	Mar. 7	13,500,000	2	1 S. A.	Oct., 1908
Railway Stl. Spring, pr.	102	.....		13,500,000	7 cum.	1¾ Q.	June, 1912
Rep. Iron & Steel	24⅛	+ ½	Oct. 16	27,191,000		.....	
Rep. Iron & Steel, pr.	80	+ ¾		25,000,000	7 cum.	1¾ Q.	Jan., 1912
Sloss-Sheffield	54½	+2½	Mar. 13	10,000,000	5	1¾ Q.	Sept., 1910
Sloss-Sheffield, pr.	100	.....		6,700,000	7 n. c.	1¾ Q.	July, 1912
U. S. Pipe & Fdy. Co.	20⅞	— ⅛	June 26	12,500,000		1 Q.	Dec., 1907
U. S. Pipe & Fdy. Co., pr.	59⅜	+1⅜		12,500,000		1 Q.	July, 1912
U. S. Steel	69¾	+1¼	April 15	508,302,500	5	1¼ Q.	June, 1912
U. S. Steel, pr.	110¾	+ ⅜		360,281,100	7 cum.	1¾ Q.	May, 1912
U. S. Steel 5s	102¼	+ ⅛		465,189,500	5	5 Q.‡	
Va. Iron, Coal & Coke.	60	+1¼	Sept. 17	9,073,680		.....	Oct., 1907
Westinghouse Air Brake.	176	+1¾	Oct. 1	20,000,000*		5. †	July, 1912
Westinghouse Electric	73	.....	June 12	3,998,700*	7 cum.	1¾ Q.	July, 1912

Par value of shares, $100, except those starred (*), $50.
**Includes last 1 per cent payment of 4 per cent extra.
†Stock.
‡Include 2½ regular, 1½ extra and 1 special.

Copper Stocks.

New York.—Amalgamated Copper closed 87, a net gain of 2¾.

Boston.—Anaconda closed 45⅛, a net gain of ¾; Calumet & Arizona closed 76⅞, a net gain of 2⅛; Calumet & Hecla closed 531, a net gain of 11; North Butte Mining closed 31½, a net gain of 1½; Quincy Mining closed 94, a net gain of 3½.

Financial Notes

The Mergenthaler Linotype Co. has declared the regular quarterly dividend of 2½ per cent, and an extra dividend of one-half of 1 per cent, both payable June 29.

The American Car & Foundry Co. has declared the regular quarterly dividends of 1¾ per cent on preferred and one-half of 1 per cent on common stock, both payable July 1.

The Sloss-Sheffield Steel & Iron Co. has declared the regular quarterly dividend of 1¾ per cent on its preferred stock.

The Westinghouse Electric & Mfg. Co. has declared the regular quarterly dividend of 1¾ per cent, payable July 15.

The Canadian Locomotive Co., Ltd., has declared the regular semi-annual dividend of 3½ per cent on the preferred stock, payable July 1.

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Return of Duplexing

Steel works in the east, where the duplex method of steel-making has probably gained more ground than in any other section, are again adjusting their operations to follow this process. In the uncertain course of the steel trade, little had been done in this direction during the past year. Now the makers feel justified in reviving the use of the method.

The reasons surrounding the resumption concern the conditions that originally impelled the adoption of this process. One of these was the protection of the steel maker against the fluctuations of the steel scrap market and the expectation of a growing scarcity of a desirable quality of heavy melting steel, brought about by the continued expansion of open-hearth capacity. During the past year, however, steel scrap has been relatively cheap and the supply has been ample for the fractional operations of steel plants. Then, further, prices of steel products have been so near the cost line that only the most economical processes of steel-making could be followed, if fixed charges and bonded interest were to be met. The duplex process is not a cheap method. It is not as economical as either the straight open-hearth or the Bessemer methods, generally speaking. It is, however, a more prolific producer of tonnage and this is one of its main compensating advantages. Tonnage, however, until recently, has not been the prime objective of eastern plants.

Within the past several months, there has come about in the eastern market the conditions that are essentially precedent to duplexing. Finished prices have advanced $2 to $3 a ton, steel scrap has risen $1 to $2, and is inclined to be buoyant, and there is more pressure on the mills for open-hearth tonnage. Pig iron costs are now approximating scrap costs. Hence the coming again into vogue of the duplex process at Steelton and South Bethlehem.

Record Foreign Commerce—Its True Bearing

Our foreign commerce in the fiscal year, which closes this week, has been approximately as follows:

Exports	$2,240,000,000
Imports	1,680,000,000
Excess exports	$ 560,000,000
Total movement	$3,920,000,000

Both the exports and imports make new records, the exports by 9 per cent over 1911, the previous record year, and the imports by 8 per cent over 1910, the previous record year. The total movement, imports plus exports, exceeds the best previous record, made in 1911, by 10 per cent.

The favorable trade balance does not make a new record, the $560,000,000 this year having been exceeded in 1898, 1901 and 1908, with $615,000,000, $665,000,000 and $666,000,000, respectively.

The fact that the total movement makes a new record, while the trade balance falls decidedly short of making a new record, is of the deepest significance. A favorable balance in this merchandise movement is necessary merely to enable us to break even. There is a balance in the unseen movement, which is always against us, including money spent abroad by American tourists, payment of interest and dividends upon American securities held abroad, the sending abroad of money by workmen in the United States, etc. The balance in the unseen movement is always against us, but it does not vary greatly, as the merchandise movement rises or falls. Beyond this balance in the unseen trade, there is another item that the apparent favorable balance in the merchandise movement must cover, that being freight paid to foreign vessel owners. We do not carry the goods ourselves, and as imports are valued at the foreign port and exports at the domestic port, we must pay the freight on the imports. It may be mentioned, too, that the tendency is to undervalue imports and overvalue exports, which makes another item to be covered by our apparent favorable balance in merchandise before the country can really grow richer through it.

The apparent favorable balance in the merchandise movement should have increased greatly, with the increase in the total movement, in order to make our foreign trade as profitable as it once was. Instead, we observe that in 1898, the first of the years of a very large balance, indeed the first year showing as much as $300,000,000 balance, the balance was $615,000,000, whereas the total movement was $1,850,000,000; in the fiscal year just ending, on the other hand, the balance is only $560,000,000, whereas the total movement is $3,920,000,000. Thus the total movement in-

creased 112 per cent, but the balance decreased 9 per cent. Such a showing is distinctly unfavorable. It may easily prove to be dangerous.

The fiscal year 1898, which showed this enormous trade balance, fell just before the trade revival in the United States, following the great industrial depression. There is no doubt that the large favorable trade balance helped to make business good in this country. For ten years thereafter the trade balances were uniformly high, averaging $520,000,000 a year for the 11 years, 1898 to 1908, inclusive, on a total movement, imports plus exports, which averaged less than $2,500,000,000. Since 1908, our trade balances have been relatively small. They were absolutely small in 1909 and 1910, and in 1911 and 1912 they have been fairly large in quantity, but small relative to the total movements.

It is true that mere commerce, without apparent monetary gain, may be profitable through our disposing of goods which we do not need, in exchange for goods which we do need. Such a movement is better than no commerce at all, but still better would it be, were we able to make a monetary profit out of it. If, however, we cannot make a profit thus, we could at any rate make a profit, were we able to carry the goods ourselves. Then, by paying the freight to ourselves instead of to foreigners, we should be able to keep much money in the country. The first remedy which should be applied against the present unsatisfactory condition is that of establishing an American merchant marine.

At once, however, we should recognize the fact that the mere condition of our exports in the fiscal year just ending having exceeded all previous records by a large margin does not in itself spell prosperity. Hundreds of superficial newspaper writers will comment upon these foreign commerce figures in the vein that they represent a highly prosperous condition, and tens of thousands of readers will accept the comment as fair. It is not. Our foreign commerce is not in a satisfactory condition.

Shifting of Steel Production Centers

Developments of profound importance are occurring in fixing the habitats of steel production. In the shifting and establishment of steel production centers, two influences, rarely considered in this light, exert a very great force. The first to which we refer is well established and has done much of its work; the second is just appearing. The first is the interstate commerce legislation. Its aim is already clearly established, to provide that all rates shall be fair and reasonable, and the fruition is gradually coming. The time was when it was dangerous for a manufacturing establishment to settle upon a single railway; it must select a railroad center, so that it would have "competition." Otherwise it would be "discriminated against." The railroad would undertake to reap all the manufacturing profits, leaving the manufacturing establishment simply enough to keep it in existence as a freight producer. Legislation has changed this. It is no longer necessary for manufacturing establishments to congest railroad centers, leaving long stretches of track with no local freight movement.

The second influence is suggested, though not well defined, by the term "welfare work." This sort of interest on the part of the employer has only commenced. A decade hence, it will be one of the most important, if not the most important, of the questions involved in manufacturing on a large scale. The time was that a large manufacturing establishment naturally located in a great center, because there it could secure men. In future, the tendency may be rather to locate away from a great center, because there it will be better able to take care of its men.

Both these influences, the regulation of railway rates and the assumption by the manufacturer of responsibility for the living conditions of the employes, tend to take large manufacturing establishments from the great centers. As the years pass, the result of the working of these influences will be very marked.

In the steel industry, the tendency is for the industry to spread geographically. It is hard for men to recognize this. The development of additional productive capacity always arouses great jealousy in districts removed from the locus of the new capacity. In the past few years, Pittsburgh has been experiencing some very strong feelings in regard to the growth of productive capacity in the Chicago district, but it is easily susceptible of complete proof that Pittsburgh passed through precisely a similar spasm about Chicago nearly a quarter of a century ago, and fully recovered, as Pittsburgh will do this time also. Indeed, recovery has already set in, and the announcement of a fortnight ago of the United States Steel Corporation's intention to rehabilitate the Edgar Thomson Steel Works—lately regarded by some Pittsburghers as almost a hopeless case—making it a greater plant than ever, will undoubtedly greatly hasten the recovery. Perhaps Chicago "views with alarm," to use the phrase which quadrennially comes to the front, the present development of steel-making at Duluth. All the northern districts have had their qualms with respect to Alabama, and yet in this cursory review we have neglected to mention the fears and jealousies between the interior and the lake front centers of production, or those between the Atlantic seaboard and the central west.

Repeatedly history shows that there is room for all the centers of steel production which have reasonable ground for existence, and rarely does one district grow at the expense of another.

With the general trend towards an enlargement of the area of steel production, a broadening north and south and a widening east and west, there are being felt, and will be much more felt in the future, the two influences mentioned at the outset, the regulation of railway rates and the extension of welfare work, whereby the steel industry of the future will not only have wider limits geographically, but will be more uniformly distributed, instead of being congested in a few centers of extremely small area. The map of 1925 will look very different from that of 1900.

MEN OF THE IRON TRADE

Harry E. Kies, Erie, Pa., has been appointed general superintendent of the Michigan Malleable Iron Co., Detroit.

Frank E. Sterns, recently connected with work at Panama, has been appointed assistant engineer on the New Welland canal.

Frank L. Miller has accepted the position of chief engineer of the Parkersburg Machine Co., Parkersburg, W. Va. He was formerly with the Southwark Foundry & Machine Co., Philadelphia.

John Johanningman, 481 Riddle road, Cincinnati, for the past ten years secretary of the Oesterlein Machine Co., that city, has resigned and will enter the machine tool manufacturing business.

John Alexander, of the Harrison Safety Boiler Works, Philadelphia, was elected vice president of the Associated Foundry Foremen, of Philadelphia and vicinity, at the June meeting of this organization.

E. A. Ermold, for the last five years connected with the Electro-Dental Mfg. Co., Philadelphia, has accepted a position as mechanical superintendent with the Wirt Electric Specialty Co., Germantown, Pa.

R. T. Wingo, until recently connected with the engineering departments of the Cadillac and Hupp automobile companies, has become associated with the Superior Machine & Engineering Co., Detroit, Mich.

George E. Day, general manager of sales of the Youngstown Sheet & Tube Co., Youngstown, and F. E. Merrick, head of the Colonial Supply Co., a subsidiary firm, with headquarters in St. Louis, are in Europe.

E. H. Wheeler, formerly superintendent of the Meadville Malleable Iron Co., Meadville, Pa., has accepted the position of superintendent of the malleable department of the Oliver Chilled Plow Works, South Bend, Ind.

Jeremiah Dwyer, president of the Michigan Stove Works, has been reappointed as a member of the board of inspectors of the Detroit house of correction. Mr. Dwyer has served as a member of this commission for 24 years.

J. J. Conway, for 20 years accountant for the Hamilton Stove & Heater Co., and its predecessor, the Gurney-Tilden Co., has accepted the position of secretary-treasurer of the Hamilton Lock & Hardware Co., Hamilton, Ont.

John R. Back, for many years engaged in the machine tool industry, and superintendent of the F. E. Reed Co., Worcester, Mass., has resigned that position with the Reed Prentice Co., which recently absorbed the Reed company.

Phillip Pastre has been placed in charge of the sales department of the Basic Mineral Co., Pittsburgh. Mr. Pastre was formerly connected with the New York State Castings Co., Syracuse, N. Y., and also with La Belle Iron Works, Steubenville, O.

J. Everett Knapp has severad his connections with the Randall-Faichney Co., Boston, as master mechanic and engineer. He contemplates the organization of a company for the manufacture of a line of surgical and dental instruments.

S. G. Valentine, formerly superintendent of the Dunbar Furnace Co., Dunbar, Pa., and at one time connected with Lebanon, Pa., blast furnaces, has been appointed superintendent of the Empire Steel & Iron Co.'s furnace at Oxford, N. J.

D. S. Muckley has been appointed superintendent of the Cambria Steel Co.'s wire department at Johnstown, Pa., to succeed John E. Lonngren, who recently resigned. Mr. Muckley was formerly superintendent of the wire mills at Monessen, Pa.

J. C. Horne, formerly connected with the Boston Gear Works, Fellows Gear Shaper Co., and for many years engaged in the gear cutting business, is now treasurer and general manager of the Union Gear & Machine Co., 85 Purchase street, Boston.

John A. Allen, until recently purchasing agent of the Hubbard Steel Foundry, Chicago, has been appointed purchasing agent of the Brier Hill Steel Co., at Youngstown. At one time Mr. Allen was purchasing agent for the Lackawanna Steel Co., at Buffalo.

J. G. Garrard, who for several years has been superintendent of the Franklin Park Foundry Co., was appointed chief metallurgist for the Griffin Wheel Co., Chicago. Mr. Garrard will have jurisdiction over all of the foundries of the Griffin Wheel Co.

Charles H. Wright has resigned as chief engineer of the Brown Hoisting Machinery Co., Cleveland, O., and is now engaged in special work for the company in the southwest. W. K. Monroe, manager of the engineering department, now fulfills the duties of chief engineer.

Henry W. Benn, superintendent of the Bessemer department of the Edgar Thomson works of the Carnegie Steel Co., has resigned, effective July 1. He is one of the "old guard" of the Carnegie employes, being in the company's service nearly 30 years. He will retire to the farm.

E. H. Webb, master mechanic of the Michigan Central shops at Michigan City, Ind., has been transferred to St. Thomas, Ont., to take the place made vacant by the promotion of Walter H. Flynn, who has been appointed superintendent of motive power. P. J. Burns is Mr. Flynn's assistant.

Harry Scullin, president of the Scullin-Gallagher Iron & Steel Co., St. Louis, Mo., manufacturer of open hearth steel castings, sailed for Europe a few days ago. He was accompanied by his wife and expects to be abroad for some months, visiting points of interest in Africa, Asia and Europe.

E. N. Lowe, director of the geological survey of Mississippi, who recently investigated the iron ore deposits in the Potts Camp, Winborn and Hickory Flat areas of Marshall and Benton counties, has issued a report in which the results of nine specimens of ore from representative deposits are given.

Oliver C. Hitchinson, who has been manager of the Marquette company of the General Motors Co., has taken up his duties as vice president and general manager of the Olds Motor Works at Lansing, Mich., succeeding W. J. Mead. Mr. Mead has become the head of the Amplex Motor Car Co., Mishawaka, Ind.

Joseph V. Woodworth has accepted the position of consulting engineer and New York representative of the Boston Pressed Metal Co., Worcester, Mass., with offices in the Tribune building, New York. He was former-

MEN OF THE IRON TRADE

ly consulting engineer at the New York office of the Taft-Pierce Mfg. Co., Woonsocket, R. I.

W. H. Kane, a malleable foundryman of wide experience, has been appointed superintendent of the malleable shop operated by the Fanner Mfg. Co., Cleveland.

Howard E. Wagner, sales manager for Wyckoff, Church & Partridge, Inc., New York, has accepted a similar position with the Buffalo Electric Vehicle Co., Buffalo, N. Y.

William A. Scott, for the last six years associated with the Boston office of the Westinghouse Electric & Mfg. Co., Pittsburgh, has accepted a position with the Boston office of the Crocker-Wheeler Co. After July 1 he will be located as resident manager in Springfield, Mass., with offices at 318 Main street.

J. H. Flynn Jr., who has been engaged in work on the Panama canal the last seven years, has resigned his position as mechanical engineer for the Isthmian canal commission and has been elected president of the Lines-Flynn Co., Inc., 50 Church street, New York. E. M. Lines is secretary and treasurer of the company.

Frank W. Milbourne has been elected general manager of the Southern Engine & Boiler Works, of Jackson, Tenn. He succeeds D. H. McDonald, who had been in charge for several years. Hugh M. Harris has become superintendent of the plant. Both of the new officials are among the youngest holding similar positions in the country

J. B. Mansfield has been recently appointed general superintendent of the J. E. Bolles Iron & Wire Works, Detroit. For two years Mr. Mansfield was the company's representative at New Orleans, where he also acted as manager for the Columbian Iron Works. His previous business success and wide experience makes him well fitted for his new position.

John Bath, of Fitchburg, Mass., formerly president of the Bath Grinder Co., of that city, has been appointed sales manager of the Reed-Prentice Co., which was recently incorporated with a capitalization of $2,500,000. He will have charge of the entire force of salesmen connected with the concern, and will make his headquarters in the main office in the old F. E. Reed Co. plant.

A. J. Goodhue, western sales manager of the United States Cast Iron Pipe & Foundry Co., with offices in Chicago, has recovered from a severe illness and is again able to be at his office. W. B. Franklin, who took charge of the Chicago office during Mr. Goodhue's absence, has been appointed general sales agent of the company, with headquarters in Philadelphia.

George D. Kirkham, representative of the American Steel & Wire Co. in Kentucky and Tennessee, with headquarters at Memphis, is recovering from an operation for appendicitis performed last week. Mr. Kirkham was preparing for a vacation in Europe when he was attacked and was compelled to undergo the operation. He is progressing favorably toward recovery.

Capt. G. L. Carden, general manager of the Allied Machinery Co. of America, is expected home about July 1 from Europe, where he has been extending the company's field of operations. Charles N. Thorn, assistant general manager of the New York office, at 55 Wall street, left for Europe a couple of weeks ago to take charge of the company's office at Paris during Capt. Carden's visit to this country.

Douglas H. Gordon, president of the Baltimore Trust Co., has resigned as a member of the preferred stockholders' protective committee of the Alabama Consolidated Coal & Iron Co. Mr. Gordon is one of the defendants in the suit brought by the Alabama company against the Baltimore Trust Co. and others for the restitution of nearly $2,000,000 to the treasury of the Alabama Consolidated. It is rumored that Mr. Gordon may resign his position as president of the Baltimore Trust Co.

Harvey S. Pardee recently severed his connection with the Commonwealth Edison Co., Chicago, to join the engineering firm of Miller & Pardee. They will engage in general engineering practice, specializing in illumination, and have opened offices in the Chamber of Commerce building, Chicago. Mr. Pardee is a graduate of the electrical engineering departments of the University of Minnesota and the Massachusetts Institute of Technology.

Delmer W. Call, who has been president of the Allis-Chalmers Co., Milwaukee, for a year will leave that company to become president of the Hale & Kilburn Co., of Philadelphia. The Hale & Kilburn Co., which has something over $8,000,000 stock outstanding, manufactures car furnishings and supplies about 75 per cent of all seats in use on steam and electric railroads. Mr. Call was formerly with the National Malleable Castings Co., of Cleveland.

President Carlton B. Gibson, of the Mechanics Institute, Rochester, N. Y., has announced that Phillip G. Haines, of Cincinnati, has accepted the superintendency of the new factory shop course which will be started this summer at the institute. The new course will be conducted in conjunction with several of the big factories in Rochester, and will thoroughly equip young men for mechanical positions. Mr. Haines has signified his intention of taking up his work in Rochester on July 1.

W. Ely Ainge, expert accountant and business engineer, has accepted the position of consulting accountant for the Brier Hill Steel Co., Youngstown, O., and will have his headquarters with the general offices in the Stambaugh building, that city. The rapidly increasing business of the company necessitated the office of consulting accountant, which was created at a recent meeting. Previous to the new position, Mr. Ainge had been specially retained by the Brier Hill Steel Co. since its organization about six months ago for the purpose of systematizing the business.

Acting President Levi L. Conant, of the Worcester, Mass., Polytechnic Institute, will continue in that capacity for another year. Dr. Raymond K. Morley, last year an instructor of mathematics in the University of Illinois, and former instructor in the Worcester institute, has been appointed assistant professor of mathematics. John Harland Nelson of the Case School of Applied Science, Cleveland, will succeed the late Prof. E. L. Hancock. Prof. H. C. Ives, formerly assistant professor of railroad engineering at the institute, has been promoted to a full professorship.

Mill Owners Had Punctured Tire Feeling

And Soup Houses Were Numerous in the Days of Savage Competition—Final Hearing for the Summer in Steel Corporation Case

The last week of the Steel Corporation hearings prior to the summer adjournment was devoted mainly to the taking of further testimony in connection with price agreements and pools, which existed both before and after the formation of the Steel Corporation. These included the rail pools, which were formed at various times, beginning with the "Pneumatic Association" in the early seventies and extending down to the rail association, which disbanded in 1904 or 1905; also the structural associations. Powell Stackhouse, now president of the Cambria Iron Co., and formerly president of the Cambria Steel Co., described how the breaking of a rail price agreement, about 1896, by the Carnegie Steel Co., brought about a period of ruinous price cutting, which caused great loss in the iron and steel industry. E. C. Felton, president of the Pennsylvania Steel Co., also brought out some interesting facts relative to the rail pools.

Foster Milliken, of the firm of Milliken Bros., Inc., now in the hands of receivers, was questioned at length concerning the formation of the American Bridge Co. and the character of the competition later furnished by that company. During Mr. Milliken's examination, Judge Dickinson, for the government, stated that it was proposed to show that the failure of Milliken Bros., Inc., was due largely to certain influences, which were brought to bear on New York banks, thus making it impossible for the firm to obtain money. Nothing was done by the government along this line, however.

Frederick Strauss, of the banking firm of J. & W. Seligman, was questioned about the underwriting of the securities of the American Steel & Wire Co. in 1899. John F. Tierney, cashier of the firm of Moore & Schley, also rendered testimony in connection with the affairs of his firm in October of 1907, and the amount of Tennessee Coal, Iron & Railroad Co. securities it had on hand at that time.

While the opposing counsel propose to examine some additional documentary evidence before the end of June, no more open hearings will be held before the middle of September, when the sessions will be resumed either in New York or Pittsburgh.

Mr. Millikin's Testimony

Foster Milliken, of Milliken Bros., now in the hands of receivers, was recalled to the stand for further cross-examination by Cordenio A. Severance on Thursday morning.

"What was the tonnage capacity of your company in 1900?" asked Mr. Severance.

"About 25,000 to 30,000 tons a year, I should say," replied Mr. Milliken. The witness added that only a small proportion of this was "heavy."

"What do you mean by 'heavy' work?"

"A column weighing about 10 tons and a girder about 25 tons would be classed as heavy." Mr. Severance did not find this definition of heavy material satisfactory, as he desired the witness to give definite limits in thickness, etc., between which the dimensions of heavy material would fall. The witness stated, however, that he was unable to give any such limits.

Mr. Milliken was asked about the affairs of his firm, especially in reference to the reason for its assignment in 1907. The failure, the witness said, was solely due to the fact that the architect, George B. Rice, had underestimated the cost of the rolling mill they were adding to their equipment. Prior to the failure, the firm had been doing the biggest business in its history.

"In your testimony the other day, you stated that the Rochester Bridge & Iron Works and the Lassig Bridge & Iron Works each had 7 per cent of the total 'heavy' capacity of the country," said Mr. Severance. "Do you know that the American Iron and Steel Association directory gave their total capacities as 7,200 tons and 54,000 tons, respectively, in 1901?"

The witness answered that he did not know this. He stated that he had based all his calculations on his general knowledge of the business and had not taken into consideration any published statistics.

Mr. Severance further attacked the witness' previous statement that the Detroit Bridge & Iron Co. was only a second class shop in 1900.

"Would you say that a firm that erected and fabricated the Victoria bridge over the St. Lawrence river at Montreal was a first or second rate concern?" asked Mr. Severance.

"I would have to know something about the bridge," said Mr. Milliken.

"Assuming that the bridge was a railway and highway structure, with a span of 220 to 300 feet in length, how would you classify the plant that erected it?"

"Was it single or double track?" asked Mr. Milliken in turn.

"Double track."

"Was it pin connected or riveted?"

Here everybody joined in a laugh, after which Mr. Milliken admitted that the builder of this bridge, the Detroit Bridge & Iron Co., must

Bread or Whiskey?

Percival Roberts, one of the witnesses who testified recently, was a little impatient at the delay in resuming the taking of testimony following the noon adjournment and he accordingly told Judge Dickinson not to delay the proceedings, as he was in a hurry to get back home to his farm. This reminded Judge Dickinson of a few good stories about farmers, and of one especially, about an old farmer in the Judge's native state, Tennessee. This farmer on being asked about the size of his corn crop, replied:

"Well, I harvested enough to make twenty barrels of whiskey, without counting what was wasted on bread."

have been a first-class concern at that time.

Mr. Colton then took the witness in hand and asked him a number of questions regarding the uses of the various shapes, such as girders, columns, angles, etc., used in structures.

"You stated that the underestimate in the cost of your new steel plant and rolling mills brought about your firm's failure," said Mr. Colton. "What was your original estimate of this cost?"

"$3,000,000," said Mr. Milliken. "This was secured by first mortgage bonds which were sold to J. S. Bache & Co. and William Solliman & Co."

"When did you find out that Mr. Rice's estimate of $3,000,000 was too low?"

"In September, 1906." Mr. Milliken stated that this estimate was too low by $2,000,000. Mr. Milliken stated that at the time of the failure the notes and other papers of Milliken Bros., Inc., were held by the International Bank, Guardian Trust Co., National Park Bank and Mechanics Trust Co.

Counsel for the defense objected very strenuously to the line of questioning pursued by Mr. Colton. They claimed that the failure of Milliken Bros., Inc., had nothing whatever to do with the present case. Judge Dickinson, however, arose and stated that it had very much to do with it. The government proposed to show, he stated, that Milliken Bros., Inc., because of influence which was brought to bear on certain banks in New York, were unable to obtain money at the time they needed it and hence their failure resulted. This the government failed to bring out, however.

Mr. Milliken's examination was briefly interrupted in order that Charles W. Eckhardt, now purchasing agent of Milliken Bros., Inc., might be questioned regarding certain contracts for the purchase of pig iron which Milliken Bros. Co. had made with the Tennessee Coal, Iron & Railroad Co. Mr. Eckhardt stated that in spite of a thorough search he had been unable to find any such contracts.

Mr. Milliken was then recalled and questioned about these contracts. He remembered that such contracts had been made, involving a large tonnage of pig iron to be converted into steel by Milliken Bros., Inc. As he remembered it, however, this contract had been canceled before the delivery of the iron.

Mr. Felton Testifies

E. C. Felton, president of the Pennsylvania Steel Co. of New Jersey, and also of the Pennsylvania Steel Co. of Pennsylvania, which owns the Pennsylvania Steel Co. of Pennsylvania and the Maryland Steel Co. was called to the stand on Thursday afternoon and questioned by Judge Dickinson. He stated that in the year 1898 the Pennsylvania Steel Co. had offices in Boston, New York, Baltimore, Steelton, Pa., and Philadelphia. In that year the company produced 519,000 tons of steel ingots. Mr. Felton stated that during 1897-8-9 and 1900, his company sold billets mainly in the states east of the Allegheny mountains. In the south during those years, the Pennsylvania Steel Co. sold mostly rails; around Chicago it sold mainly frogs and switches, while at San Francisco it sold rails and many other products. The government's purpose was to ascertain the products in which the Pennsylvania, Illinois and Carnegie Steel companies had competed in certain territories. Asked as to the price of the standard Bessemer rails, Mr. Felton stated he had only the prices which were quoted f. o. b. at the mills of the Maryland Steel Co. These were $19.44 in 1898, $22.44 in 1899 and $29.78 in 1900.

"Were the Pensylvania and Maryland Steel companies in a rail pool?" asked Judge Dickinson.

"Yes," answered Mr. Felton. "This association was formed in 1900. The original members were the Colorado Fuel & Iron Co., Illinois Steel Co., Carnegie Steel Co., Cambria Steel Co., Pennsylvania Steel Co., and the Lackawanna Steel Co. The National Steel Co. came in later, but stayed in only a year. The Colorado and Lackawanna companies also left before the end of the pool."

Mr. Felton described the meetings held by this association. The members would discuss prices and conditions of the trade and they would then set some price which they re-

Iron Prices Advance More Than Steel in Ten Years

E. C. Felton, president of the Pennsylvania Steel Co., brought with him to the witness stand on Thursday a large sheaf of documents, full of various statistics which he had obtained from the records of the American Iron and Steel Association. He found it necessary to refer to them only once, when Mr. Lindabury, in cross examination, asked him to compare the prices of pig iron and rails for the decades 1901-10 *and* 1891-1900.

He gave the average price of pig iron f. o. b. Pittsburgh for 1901-10 *as* $17.95 *per ton, which was* $4.29 *above the average price for the preceding decade. For standard Bessemer rails, the price per ton, f. o. b. Pittsburgh, was* $27.93, *an increase of* $1.82 *over the average price of the preceding decade. The bringing out of this point afforded much satisfaction to the counsel for the Steel Corporation, who contended that the advance in the price of finished material has not kept pace with the advance in raw material, and that the Corporation, not being a seller of pig iron, has, therefore, not received its proportionate benefit.*

"I was glad to see this point brought out," said Mr. Felton later to a representative of THE IRON TRADE REVIEW.

Made Milliken Figure

Foster Milliken, of the structural firm, Milliken Bros., Inc., which is now in the hands of receivers, was plagued more than usual by the counsel for the Steel Corporation, who tried hard to shatter some testimony he had rendered regarding the percentage of the "heavy" capacity of the country controlled by certain companies at the time the American Bridge Co. was formed. He had stated to the government counsel that the American Bridge Co. had taken over 80 *per cent of the "heavy" capacity of the country. In cross-examination, Mr. Severance immediately wanted to know just how Mr. Milliken had reached his conclusion as to the* 80 *per cent. He gave the witness a pad and pencil and kept the latter grinding out statistics for over an hour. Through it all, however, Mr. Milliken never once showed a trace of annoyance. He proved to be a cool, self-possessed witness, who delievered his testimony in an easy, urbane manner; nevertheless, he appeared to be slightly bored with the proceedings.*

garded as satisfactory. There was no attempt, however, said Mr. Felton, to make the members live up to these prices; they were free at all times to take what prices they could get.

"As a matter of fact, however," said Mr. Felton, "we generally stuck pretty closely to the price which we had mutually recognized, in the meetings, as a fair one."

Mr. Felton stated that the Lackawanna Steel Co. withdrew from the association at the time it closed down its Trenton mills; later, when it again manufactured rails, it once more came into the pool.

Mr. Felton said that the members also talked over percentages at the meetings and decided what percentage should be fair for each concern. No attempt was ever made to restrict the output of any member. Each company, however, which exceeded its allotment, paid in for every excess ton a sum equivalent to the difference between either $17 or $18 (Mr. Felton had forgotten which) and the price per ton at the mill. This money was in turn paid out to the members which had sold below their allotments. The Carnegie and Illinois Steel companies together had an allotment of from 50 to 60 per cent; the Pennsylvania and Maryland Steel companies had about 9 per cent together. These were allotments which were fixed at the first meeting. Mr. Felton did not remember the other allotments.

At the first meeting in New York, when the rail pool was formed, the following attended: Powell Stackhouse for the Cambria Steel Co., Walter Scranton for the Lackawanna Steel Co., C. M. Schwab for the Carnegie Steel Co., either John W. Gates or Judge Gary for the Illinois Steel Co., Mr. Osgood for the Colorado Fuel & Iron Co., and Mr. Felton for the Pennsylvania and Maryland Steel companies. The following also attended many of the subsequent meetings: W. E. Corey, E. J. Buffington and William Reis, the last named for the National Steel Co.

"Were not the years prior to 1900 periods of price cutting and extremely disagreeable competition?" asked Mr. Lindabury, in cross examination.

"Yes, they were the worst in all my experience," said Mr. Felton.

"So, after going through this severe period, the rail manufacturers got together in 1900 and decided to form a pool for their own protection?"

"Yes, that was the idea." Mr. Felton then pointed out the main underlying causes which had brought about the formation of the pool. These were the ruinous prices and the undesirable competition which then characterized the market.

Mr. Felton had with him a gripfull of all kinds of statistics with which the government had asked him to provide himself. He had few occasions to refer to these, however.

Steel Hearing Witnesses Typifying Their Industry

The men of the iron and steel world are both forceful and picturesque and in character typify an industry, which in magnitude and applied force eclipses any other. Into their personalities, something of the nature of the metal, as it is hammered, forged and rolled in the mills, seems to be injected, and this characteristic never lies very far beneath the surface. In these latter days of steel manufacture, when machinery and processes have been developed to a high state of perfection and run along in well-lubricated grooves, the school is still a difficult and rough one for those who would learn in it; for the real brand of experience, however, one must turn to the pioneers, the men who grew up with the business, who learned their trade in the mills and came into closer contact with the metal than is required today.

Several of the old guard have appeared from time to time in the Custom House at New York, to be questioned by the counsel in the Steel Corporation hearings. Foremost among the recent witnesses was Powell Stackhouse, who will be 72 years old in a few days and has been in the business since 1856. He was president of the Cambria Steel Co. until March, 1910, and is still president of the Cambria Iron Co. On the stand he told about the "Pneumatic Association," which was the father of all the pools; about the famous "Gates-Carnegie war" and its effects, and about many other happenings in the iron and steel world of the past four decades. With the exception of dates, his memory was good and he gave his testimony in a crisp, clear manner. He evidently enjoyed recalling some of his old experiences out of the now dim past. Mr. Stackhouse came to the hearings clad, as usual, in a soft shirt, with a bow necktie. Pinned to his shirt was the cross of the Loyal Legion that one always associates with his picture.

Another pioneer, whose experience, however, does not run back as far as that of Mr. Stackhouse, was E. C. Felton, president of the Pennsylvania Steel Co., and connected with other large companies. Mr. Felton was questioned mainly in connection with former rail and structural pools and he brought with him a huge sheaf of statistics, which, however, he was not forced to refer to very often. Mr. Felton has a ready smile and talks in an easy, conversational style.

Testimony of Mr. Stackhouse

Powell Stackhouse, president of the Cambria Iron Co. from 1892 up to the present time, and president of the Cambria Steel Co. from the time it was organized in 1898, to lease and operate the Cambria Iron Co.'s works, until March of 1910, was the first witness examined on Friday.

"In what products did your company compete with the Illinois Steel Co. prior to 1901?" asked Judge Dickinson.

"In rails and rail fastenings, principally. Their selling territory was chiefly in the west and northwest."

"What about the Carnegie Steel Co.?"

"We directly competed with it in our common products such as plates, shapes, rails, etc., principally in states east of the Mississippi."

"State whether or not there was competition between the Illinois Steel Co. and the Carnegie Steel Co. in the sale of rails in 1896 and 1897."

"There was very savage competition, as I remember it," said Mr. Stackhouse.

Price Agreements Broken

Mr. Stackhouse stated that this competition had its inception in the breaking of a price agreement; just who broke it he was not sure, but he thought it was the Carnegie Steel Co. Mr. Stackhouse was asked how long this agreement had been in effect prior to the break. He stated that he did not remember, but he thought it was some years. He said there had been agreements ever since the manufacture of rails was begun

in this country. The first agreement was called the Pneumatic Association; this lasted for many years and its secretary was Robert Kennedy. Its members made rails under a license owned by Messrs. Griswold, Winslow, Durfee, Morrell and others. Mr. Stackhouse would not give any dates in connection with the formation of these agreements, since he said he could not be certain of these. The witness also told about the agreement which was formed between rail makers subsequently to the break between the Carnegie Steel Co, and the Illinois Steel Co. The latter agreement, he said, continued to exist for a few years after the formation of the United States Steel Corporation.

"Was your company ever a party to a structural agreement?" was asked.

"Yes," replied Mr. Stackhouse. "There were ten or a dozen members: Carnegie, Illinois, Cambria, Phoenix, Pencoyd, Passaic, Universal, Pottsville Iron & Steel Co., and others. The association was also formed subsequently to the rail break between the Illinois and Carnegie Steel companies.

"The association fixed prices and allotments," said Mr. Stackhouse. "It maintained a secretary to whom reports were made. It was finally disbanded as the members were advised that the objects of the association were unlawful."

His company was also a member of a plate association, joining the latter some time after its formation, said Mr. Stackhouse. This was also disbanded as the members were advised that it was unlawful. The pool tax, Mr. Stackhouse said, changed constantly.

On cross examination by Mr. Lindabury, Mr. Stackhouse, who will be 72 years old in a few days, said that he had been in business since 1856. He was asked about the break in the rail agreement which precipitated the Gates-Carnegie war. He stated that it brought on ruinous prices and very savage competition. The effects were felt particularly by jobbers who failed in great numbers as a result of the lowering of values of their stocks. The depression extended to the workmen, the rate for labor decreasing to $1 a day at most works.

"Was there not a line of soup houses extending from New York to Chicago?" asked Mr. Lindabury.

"I don't know the length of it, but a good many people ate soup," answered the witness.

Mr. Lindabury's object in securing this testimony was to show the beneficial influence of price agreements on general business conditions, as contrasted with the dire results of unrestricted price cutting and ruinous competition.

In describing the effects of the Gates-Carnegie war, Mr. Stackhouse stated there were no failures among large manufacturers. A number of mill owners, however, got tired of the discouraging conditions and sold out.

"They got a sort of punctured tire feeling?" queried Judge Dickinson.

"Yes, that's a very satisfactory way of describing it," answered Mr. Stackhouse.

Steel Cost is Labor

In re-cross examination, Mr. Lindabury asked the witness what entered into the cost of finished steel products. Mr. Stackhouse said the cost was made up mainly of labor charges. The cost of labor, he said, is constantly getting higher.

Mr. Stackhouse, under further questioning by Judge Dickinson, stated that the competitors of the Steel Corporation are unable to get higher prices for their products than those which the Steel Corporation charges. He stated that the minimum price of rails has been $28 for several years, this having originally been set by the Corporation. The others in turn used it as their minimum price. This testimony was strenuously objected to by the Steel Corporation counsel.

Financing of Wire Company

Frederick Strauss, of the banking firm of J. & W. Seligman, was questioned next about the underwriting of the securities of the American Steel & Wire Co, in 1899. He produced a list of the holders of these securities which the government put in evidence.

Mr. Strauss said that of the stock of the American Steel & Wire Co. of New Jersey, the subscribers to the syndicate received $28,000,000 in preferred stock and $16,800,000 in common stock for $28,000,000 they put up. The preferred stockholders of the American Steel & Wire Co. of Illinois received $12,000,000 preferred and $7,200,000 common on a basis of one share preferred and six-tenths share of common for each share they held. Common stockholders of the American Steel & Wire Co. of Illinois received one and two-tenths shares of common stock, accounting for $14,400,000 of the New Jersey company's stock. The promoters received $11,600,000 in common stock, divided as follows: Wasserman Bros., New York, $400,000; Baldwin, Gurney & Co., Chicago, $7,400,000; J. & W. Seligman Co., New York, $3,800,000.

Mr. Strauss stated that at one time, he believed it was in the early part of 1900, his firm, J. & W. Seligman Co., interested itself in the organization of a bridge company. This project antedated the formation of the American Bridge Co. The business was brought to the firm by I. Gifford Ladd, and the latter from time to time brought others along to take a part in the discussion; these included Charles McDonald, either Mr. Post or Mr. McCord, C. M. Schwab, Frederick Voorhees, Paul E. Defere, Percival Roberts and others. It was proposed at the time to bring 29 bridge companies into the organization. The plan fell through, however.

Mr. Strauss was excused without cross examination and the hearings were adjourned, to be resumed about the middle of September, in either New York or Pittsburgh. Counsel for the defense were in favor of deciding upon a definite date, but Judge Dickinson preferred to postpone the fixing of the exact time until later.

Car Builders Unable to Fill Orders

An investigation into the matter of freight congestion is being conducted by the Canadian board of railway commissioners at Ottawa. J. W. Leonard, assistant to the vice president of the Canadian Pacific railway, states that the shortage of rolling stock is due to the inability of the companies to have stock manufactured. The Canadian Pacific has authorized the expenditure of $19,000,000 for rolling stock, but has been unable to obtain reasonable deliveries from manufacturers.

In compliance with an order of the commission, the four largest railroads, the Canadian Pacific, Grand Trunk, Canadian Northern and Great Northern, have filed statements of new equipment ordered and now under construction. The four companies have more than 18,000 box cars on order for delivery before Oct. 1. There are also orders for more than 200 locomotives, 1,000 refrigerator cars and 1,400 coal cars. The majority of the orders have been placed with Canadian shops, but about one-third of the box cars are being built in the United States.

The organization committee of the Allis-Chalmers Co. has received all but $800,000 of the $11,148,000 Allis-Chalmers bonds. More than 80 per cent of each class of stock has already been deposited.

LABOR REFORM

Discussed in Circular Letter Sent Out by Chairman Gary.

Changes in working conditions are suggested in a circular letter just issued to stockholders of the United States Steel Corporation by Chairman E. H. Gary. The letter says that the finance committee of the Corporation, acting in accordance with its recommendations of April, 1907, and with the recommendations of the committee of stockholders which last winter investigated labor conditions at the Corporation's mills, has passed a set of resolutions. A review is made of the stockholders' committee report, which was fully published in THE IRON TRADE REVIEW, at the time, and a statement made of the total of annual expenditures for the benefit of workers which would otherwise be applicable to dividends, as $5,450,000.

The resolutions passed, recommending the elimination of seven-day week and the so-called "long turn" where expedient and a reduction to a minimum of any unusual length in work hours that emergencies and unforeseen conditions many sometime demand, follow:

"Resolved that, in accordance with the spirit of the resolution adopted by this committee on April 23, 1907, 7-day labor should be eliminated in all mines, mills, shops, railroads, docks and works of the Steel Corporation, except under special circumstances, and then upon the consent of this committee.

"Resolved: That, the so-called 'long turn', formerly followed in the change of shifts in continuous process work, should be eliminated or reduced in all cases where it now continues among employes of the subsidiary companies, except under special circumstances, and then only upon the consent of this committee.

"Resolved: That conscientious efforts should be made by all to reduce to a minimum any unusual length in work-hours that emergencies and unforeseen conditions may sometimes demand.

"Resolved: That copies of these resolutions be sent to the presidents of all subsidiary companies, with the recommendation that all operating officials be governed accordingly."

With regard to the hours of labor, the finance committee has passed the following:

"Resolved: That the chairman, Mr. Percival Roberts Jr., and the president of the Corporation be appointed a committee to consider what, if any, arrangement with a view to reducing the 12-hour day insofar as it now exists among the employes of the subsidiary companies is reasonable, just and practicable."

The following table shows the annual expenditures for the benefit of the workers which would otherwise have been applicable to dividends:

Relief for injury and payments to families of men killed	$2,000,000
Accident prevention	750,000
Sanitation and welfare work	1,250,000
Pension payments	200,000
For creation of permanent pension fund	500,000
Cost of stock subscription plan	750,000
Total	$5,450,000

Judge Gary states that wages have been advanced 25 per cent since the organization of the Corporation. He adds that the finance committee has under consideration the recommendation of the stockholders' committee that reliable first hand information as to matters affecting the workmen be furnished at stated periods to stockholders.

Erect Concentrating Plant

For the treatment of low grade ores, of which there is a very large deposit at the property, the M. A. Hanna interests of Cleveland have awarded a contract for the erection of a concentrating mill at the American mine, Marquette iron range. It is expected the plant will be completed prior to Dec. 1, next. The mill will have a capacity of 500 tons daily, with provision for the installation of additional units at any time it is desired to increase the output. Electrical power will be used. While the American mine is producing an ore of very fine quality, it has an extensive body of material running some 40 per cent in metallic iron.

In the adjoining Maas lands, now under lease to the same interests, there are many millions of tons of mineral of similar quality. With the process of concentration a demonstrated success, as already has been indicated by practical tests, a great body of ore of a class now in little demand will be available to supply furnace needs.

Preparatory to the development of the Maas tract, on the west, drifting is in progress from the American workings. This will open the high grade Bessemer deposit found by the diamond drilling previously conducted and will lead to the determination of the mining program. A unique development in the American property, itself, has been the recent discovery in the lower levels of soft hematite ore of excellent quality. The mine has been producing a hard ore exclusively.

BIG PRODUCTION

Hoped for at St. Paul Mine—Once Famous Mine on Wane.

Chicago, June 25. — Corrigan-McKinney & Co. have resumed operations at the St. Paul mine, near Hibbing, Minn. This mine has been idle since 1907, during which year it produced 13,200 tons of ore. In fact its total production up to this year has only been 137,430 tons and there is some doubt whether it has been a successful property, since its development required considerable expense, but it is expected to develop into a very valuable property. It is a very deep pit and some of the stripping was done under difficult conditions. There are two shovels at work in the pit at the present time. The Stevenson mine, another open pit near Hibbing, controlled by Corrigan, McKinney & Co., is shipping as usual, one steam shovel now working in the ore. The glory of this great mine has faded. For a number of years it was in the million-ton class. It is still, however, an excellent property; it shipped 500,323 tons last year and has produced up to date 11,437,593 tons of iron ore. It is also a deep mine, very long and straight, and some of the overburden which had to be removed was from 80 to 90 feet thick.

Acquires Ore Properties

Pittsburgh, June 25. — The Zinn Iron Mining Co., composed of Washington and Green county interests and owning about 8,000 acres of iron ore lands in Rockridge and Augusta counties, Virginia, is understood to have disposed of the property to a new syndicate, with P. J. McGuire, of Pittsburgh, as the head, and a new company is being planned to operate these mines. A charter will shortly be asked for the company with $1,000,000 capital. The process for eliminating the impurities from the ore is said to have been devised which will make the property workable for merchant furnace consumers. About $400,000 is understood to have been paid for the ore property.

Use Turbine Blower.—The E. & G. Brooke Iron Co., Birdsboro, Pa., has purchased a turbine-driven centrifugal blowing unit from the General Electric Co., which will shortly be installed at its plant to replace blowing engine capacity recently damaged by the destruction of the company's power house.

LOW WATER BOILER TESTS

Safety of Sectional Boiler is Proven —Ordinary Boiler Explodes.

A demonstration which promises to be of great importance in the future construction of locomotive boilers, was made by the Lukens Iron & Steel Co., at Coatesville, Pa., June 20, under the direction of Dr. W. F. M. Goss, dean of the college of engineering, University of Illinois. Two full size locomotive boilers, designed for high speed heavy passenger service, were each subjected to severe low water tests. Both boilers were identical in size and design, except that one had a Jacobs-Shupert sectional firebox, while the other had an ordinary radial stay firebox.

For the purposes of these tests, both boilers were mounted in a field and 50 feet apart, and were operated from a "bomb proof" located 200 feet away from the nearest boiler. Oil was used for fuel because of the danger to which a fireman shoveling coal would have been exposed. In the process of testing, each boiler was brought to a condition of operation closely approaching maximum power estimated to be 1,400 horsepower, which is equivalent to that required to haul a heavy passenger train at 60 miles per hour. The supply of feed water was then shut off, but all other conditions were continued unchanged. The water level gradually fell, exposing the crown sheet and other portions of the heating surface to the full effect of the fire. Under normal operating conditions these surfaces are protected from overheating by contact with the water. In these tests, the lowering of the water level deprived the plates of this protection, and they became red hot. The vital details upon which the boiler depends for its security and safety were subjected to conditions somewhat analogous to those affecting a tea kettle, which on a hot stove, has been allowed to go dry.

The boiler having the Jacobs-Shupert sectional firebox was continuously tested under these severe conditions for 55 minutes without developing any failure, notwithstanding the fact that the level of the water fell to a point about 35 inches below the crown sheet. The test was then discontinued because the small amount of water remaining did not evaporate sufficiently fast to supply the draft necessary to maintain the fire. At the conclusion of this test, the Jacobs-Shupert firebox was apparently in good condition, and ready for further service. The ordinary radial stay boiler was then tested under conditions identical to those described. After the test of the ordinary boiler had been in progress for 23 minutes, and the water level had fallen to 14½ inches below the crown sheet, an explosion occurred. The crown sheet and the stays, which hold it in place, having become highly heated, pulled away from each other and released the pressure in the boiler. The discharge of steam was through the firebox and the force of the explosion amidst clouds of steam and smoke, was sufficient to throw parts from the furnace in all directions for a considerable distance, and to lift the entire boiler, weighing 40 tons, several feet above its foundation. The damage to the boiler was such as to make necessary its reconstruction. Each boiler was maintained under its normal working pressure of 225 pounds throughout the test. The tests were witnessed by 8,000 persons, among whom were several hundred railroad men, government officials, engineers and scientists from many different parts of this country, as well as abroad.

To Install Core Ovens

The Ford Motor Co., Detroit, has contracted with the Rockwell Furnace Co., New York, for one of the largest installations of small core ovens in the automobile field to be used in the company's new foundry. This installation consists of 24 ovens containing 88 shelves. The ovens are of what is known as the "Reel type" core ovens, each shelf being a complete circle about 5 feet in diameter, turning independently on a central axis. One half the shelf is in the oven with the cores on it being baked while the other half of the shelf is outside, serving as a rack. Producer gas will be used as fuel. This type of core oven is said to be especially adapted for automobile work.

Liability Law Case

In the court of common pleas of Camden, N. J., recently, Thomas Richards, an employe of the New York Ship Building Co., accepted $600 in settlement in lieu of $6.47 for 100 weeks' pay, to which he was entitled under the New Jersey employers' liability law for the loss of an eye while at work in the ship building plant.

The Phoenix Bridge Co., Phoenixville, Pa., has ready for shipment the 3,000-foot bridge which is to span the Juna river, a tributary of the Ganges, in East India. This bridge is being erected for the English government.

DUTIES REDUCED

By Canadian Government on Number of Articles.

Toronto, June 25. — The Canadian government by order in council has abolished or reduced the duties on a number of articles used as raw maertial by Canadian manufacturers, which are not produced to any extent in Canada. The iron and steel trades are interested in the following changes: Artificial abrasives in bulk, crushed or ground, imported for the manufacture of abrasive wheels and polishing composition are placed on the free list; special parts of metal in the rough imported by manufacturers of cameras or kodaks are reduced to 7½ per cent ad valorem under the general tariff, and 5 per cent ad valorem under the British preferential tariff; drawn iron or steel hoop, band, scroll or strip No. 14 gage and thinner, galvanized or coated with other metal or not, imported by manufacturers of mats, are reduced to 5 per cent under the general tariff, and made free under the preferential tariff.

There is considerable uneasy feeling among protectionists in view of the attitude of the government in making tariff changes without a reference to parliament, especially as regards the reduction of the cement duty in response to the strong pressure brought to bear by the western provinces. It is feared that in view of political exigencies the government is ready to abandon the principle laid down of preserving the stability of the tariff and making no changes except as part of a general revision after the whole subject had been carefully studied by the tariff commission. The reduction of the cement duty is regarded as a serious indication of weakening and the possible forerunner of more important concessions to the demands of the west for large reductions in the tariff. A significant feature of the situation is that although by a recent decision of the courts, sized lumber planed on one side has been declared to be dutiable at 25 per cent, the government has appealed the case to the supreme court and in the meantime given instructions that the duty will not be collected, pending a final decision.

The diamond drill which has been operating for the last two years on the Minnesota Steel & Iron Co.'s property on the Vermillion range closed down last week. It is not known definitely whether or not any more drilling will be done on the property.

RECEIVERS APPOINTED

For Alabama Consolidated Coal & Iron Co., After Attempt to Reorganize.

The Inland Steel Co. has created a new issue of $10,000,000 6 per cent extension and refunding bonds, dated July 1, 1912, and due July 1, 1942, of which $1,500,000 will shortly be offered at par by the First Trust & Savings Bank, of Chicago. The issue provides for the retirement of $2,400,000 6 per cent prior lien bonds outstanding, and for additions and improvements to the property. The new bonds are secured by a first mortgage on all the property of the company.

Alexis W. Thompson, president of the Inland Steel Co., in a letter concerning the sale says:

"The diversity of its products has enabled the company to establish business relations with a large portion of the steel consuming trade, thereby giving it a very broad market for its products, resulting in its unusual stability to its business. It owns three valuable ore leases involving three producing mines which are carried on the books at actual cost. There is sufficient ore in these mines to insure a good supply at a very reasonable cost for the period that these leases still have to run, which would average more than 30 years."

Carelessness Blamed

Julius Kruttschnitt, vice president and director of maintenance and operation of all the Harriman lines, has announced a comprehensive plan to secure greater safety and protection for the men of the system, with special reference to the industrial department of the road's work. Beginning July 1, committees of the subordinate officers and men in the shops and along the line, division superintendents, master mechanics and others, are to be formed to cooperate with the road in a systematic campaign to reduce accidents.

Mr. Kruttschnitt said that the bulk of the accidents and injuries to men in railroad work come not in the operating of the lines, but in the industrial departments, and most of them through carelessness and in ways that can be avoided. The Harriman system has reduced in eight years of active campaigning for safety through extensive block signal and interlocking systems the number of accidents in its operating department 75 per cent.

"With the co-operation of the men in the industrial part of our work," said Mr. Kruttschnitt, "we expect to reduce the accidents in this department fully as much. We do not claim originality for the present plan. The Chicago & Northwestern and the Pennsylvania have put such a plan in operation and have obtained admirable results. As I remember, the Pennsylvania has reduced its accidents in this line of work through such a system by from 60 to 63 per cent. We can do likewise."

Japanese Tube Plant

The formation of a company for the manufacture of steel pipes and tubes in Japan has been projected for some years past, and it was reported lately, says His Majesty's commercial attache at Yokohama, that a well-known Japanese firm was making preparation for manufacture by the Mannesmann process. This venture, however, seems to have been postponed, and another set of promoters, including some prominent men, are discussing the possibility of forming a company and starting work in September of next year. A company has been formed at Osaka for the galvanizing of sheets, and is now producing 5½ tons per day. The enterprise is at present more in the nature of an experiment, and its success will depend very largely on the price at which British black sheets are to be bought, for it will probably be some time before the Imperial Steel Works at Wakamatsu will be able to roll the thin sheets which are required for the various gages used in this industry.—*Glasgow Herald.*

Dividends Resumed

Directors of the Colorado Fuel & Iron Co. have declared the first dividend since 1903, by announcing a distribution of 5 per cent on the preferred stock payable in equal installments on July 20, 1912, and Jan. 20, 1913. The last previous dividend paid was 4 per cent and since that time there has been accumulated 76 per cent in back dividends on the preferred, which is a cumulative 8 per cent issue.

The Pennsylvania railroad is having a car built with a capacity of 100 tons and a weight of 135 tons, for use in loading vessels at Girard Point, Philadelphia. The car will be 12 feet 6 inches high and 50 feet long, the entire load being dumped at one time in the hold of a vessel. This will be the largest coal car in the world.

ISSUES BONDS

To Provide Additions and Improvements to Property of Steel Co.

Halsey M. Barrett, of Newark, N. J., and Parry Coffin and Harrison S. Matthews, of Birmingham, Ala., have been appointed receivers of the Alabama Consolidated Coal & Iron Co. by the courts of Trenton, N. J. The application for the appointment was made by the American & British Mfg. Co. and follows an unsuccessful attempt at reorganization of the company.

In addition to a heavy bonded indebtedness upon which default has been made, the company had a current liability, April 31 last, of $726,485. The pay roll, aggregating $40,000 a week, has not been met for the past two weeks.

The company has an outstanding capital of $3,750,000, against which there are three sets of bonds aggregating $9,000,000. Last month the company defaulted in the payment of interest upon the first series to the extent of $41,950. The Baltimore Trust Co. has a claim of $330,000 against the company on promissory notes, but has been restrained by the Maryland courts from disposing of $1,250,000 in bonds put up with it as collateral. The balance sheet of the company shows a surplus of $693,134 and available current assets of $577,699.

The company's inability to finance its affairs is attributed in the bill to "the financial stringency."

Attacks on the methods employed by Joseph H. Hoadley as the controlling power of the Alabama Consolidated Coal & Iron Co., marked the argument last week before Judge Rose in the United States District Court at Baltimore in the action of that concern against the Baltimore Trust Co. to have declared illegal the issuance of $1-collateral pledged on a note for $330,000 held by the Baltimore Trust Co. The argument was made by Atty. Edgar Gans on behalf of the defendant Baltimore Trust Co. In a maze of legal technicality Mr. Gans dwelt on the point that from the time of the adoption of resolutions in 1903 Mr. Hoadley had done everything possible to ratify what was going on in the affairs of the Alabama Consolidated concern. It is only recently, argued Mr. Gans, that Mr. Hoadley has experienced a change of mind.

PROCESS PATENT

Held by Canadian Manufacturer Sold to Toronto Capitalists.

R. L. Henderson, proprietor of the Canadian Malleable Iron & Steel Co., Toronto, which for the past two years has been treating steel by a new process for converting ordinary steel into tool steel of the highest quality, has disposed of his patent for the process to a syndicate of Toronto capitalists whose names are not made public. J. J. Main, formerly general manager of the Polson Iron Works, is to be manager for the new owners.

The process, for which the Morgan interests in the United States are said to be negotiating, is described as follows: The furnace used is rectangular and composed mainly of fire brick, having two steel doors opened and closed by a winch to admit of the entrance of flat cars on which the charge of steel rests in the heating chamber. The steel is loaded on the car bedded with fire brick, the bed forming the base of the furnace. When the car is drawn into the furnace and the doors closed, the heat is turned on. This is supplied by a current of air driven into the heating chamber by a pressure of 14 ounces to the square inch and mingling with the carbonic acid gas arising from the oil fuel used. In four or five hours the process is complete and the heat withdrawn. The present capacity of the plant is 25 to 30 tons per day.

Russian Pig Iron Production

The production of pig iron in southern Russia made great progress last year, an aggregate of 147,859,000 poods having been turned out for the year, as compared with 126,385,000 poods in 1910, showing an increase of 21,474,000 poods. Notwithstanding the greatly increased production, the stocks held at the close of last year did not show any material increase, coming out at 3,814,000 poods, as compared with 2,803,000 poods at the close of 1910. Last year's production may be analyzed as follows: Casting pig, 32,259,000 poods; steel pig, 111,317,000 poods; and other descriptions, 4,283,000 poods. There were 45 blast furnaces in southern Russia in 1911, as compared with 36 at the close of 1910. The production of steel ingots in south Russia last year amounted to 130,459,000 poods, as compared with 114,914,000 poods in 1910. The production of 1911 may be sub-divided as follows: Martin ingots, 91,673,000 poods; Bessemer ingots, 29,205,000 poods; and Thomas ingots, 9,581,000 poods. A pood, it should be added, is 36 pounds English.—*The Engineer and Trade Advertiser.*

WILL MAKE NAILS

At Plant of Dominion Steel Corporation Within a Few Days.

Toronto, June 25.—President J. H. Plummer, of the Dominion Steel Corporation, states that the manufacture of nails will be commenced in a few days. The corporation will thus avoid having to compete with wire rods coming in duty-free from the United States, as the nail output will be protected under the present tariff.

Obtain Charter Rights

Charter rights have been obtained for the development of an extensive electric power generating and distributing corporation in the state of Pennsylvania. Several important financial institutions are named as interested parties, prominent among which are Kuhn, Loeb Co., of New York, and W. S. Kuhn & Co., of Philadelphia. In addition to amalgamating a number of companies now operating, tentative plans have been formulated for establishing power plants on various tributaries of the Allegheny river.

Gets Arms Contract

The Bethlehem Steel Co. has received an additional order for arms and ordnance from the government of Argentine Republic amounting to about $400,000. This contract supplements orders placed through this company by the Argentine government, some of which are in connection with the equipment and armament of the two battleships now building in the United States for that country.

Would Furnish Power.—The Bethlehem Steel Co. is trying to secure contracts for furnishing power to the cement mills in the vicinity of Nazareth, Pa., it is said, and has been successful in several instances. The power will be furnished as soon as the new coke ovens are completed and in service, and gas is to be used as the fuel for manufacturing the electricity. The steel company claims that it can furnish power as cheaply, if not cheaper, than the other companies who are trying to get into the territory.

HOLDINGS SOLD

Stock of Republic Company Held by Gates Estate Small.

Before his death John W. Gates was credited with possessing about 40,000 shares of the preferred and common shares of the Republic Iron & Steel Co. That the interest of the Gates estate is now but a nominal one, and that control is represented by the reorganized executive committee, is admitted. It is believed that the larger percentage of the Gates estate holdings were acquired by the present members of the Republic board. The election of Leonard C. Hanna as a director and member of the executive committee, adds strength to Republic. Mr. Hanna, whose home is in Cleveland, O., is regarded as one of the most conservative and experienced steel manufacturers in the country. A year or more ago Mr. Hanna was a member of the board of the Republic Iron & Steel Co., but resigned. His return to the board as well as the executive committee is significant.—*Wall Street Journal.*

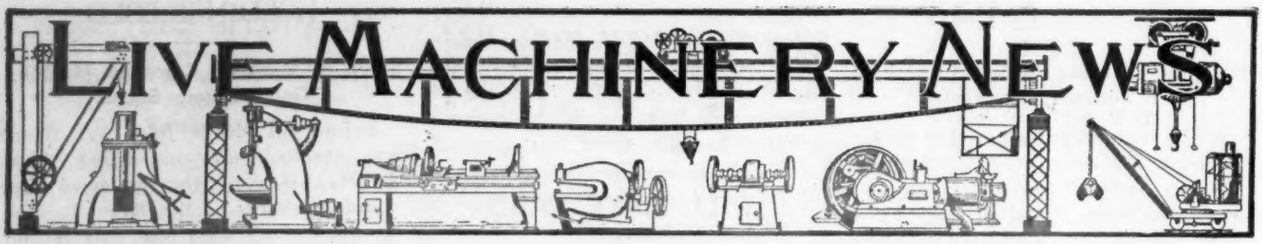
Obituaries

Richard F. Smith, of Reading, at one time interested in the iron business at Dale Forge, Pa., died June 16, at the home of his nephew in Trexlertown. Mr. Smith was 94 years old.

Eli H. Janney, inventor of the Janney car coupler, died recently at his home in Alexandria, Ga., aged 80 years. He was major and field quartermaster on the staff of Gen. Robert E. Lee, C. S. A., during the civil war.

James Stevens, who was president of the Rome Merchant Iron Mill, Rome, N. Y., for 25 years, died June 14, at that place, at the age of 77 years. He retired as president of the mill in April, 1911, when he gave up active business life. Mr. Stevens was a prominent business man and had served as a member of both the New York assembly and state senate.

The Reading Steel Castings Co., with plants in Reading, Pa., and Bayonne, N. J., has recently purchased a large piece of ground on Lafayette street for the purpose of extending their Reading plant. This purchase was necessitated on account of the plant's west side being tied up by the Schuylkill river and the east by the Tulpehocken. It is expected that the plant will double its force when the new structure is completed.



In New York, June will not show as large a total of business as was booked in May. Dealers have been kept fairly busy, however, filling scattered orders for one or more machines. Railroad companies have not supplied a normal amount of business for several months, although it is believed roads will be especially active the next two or three months. The only important inquiry to come into the eastern market recently is that of the Oregon Shore Line Co., which is calling for about 30 tools for its several shops. Leading eastern transportation companies will put out inquiries, it is believed, for important machinery needs the last half of 1912. Builders of cranes have closed for a number of machines recently, and there are several important inquiries pending for this type of machine.

In Pittsburgh the machinery market is experiencing the best volume of inquiry for some years, estimating departments being overworked. New business actually booked is not yet up to what is desired by the makers, but there is a good volume in the aggregate of small orders, and some fairly good sized ones making prospects for the last half of the present year rather encouraging. Prices are still somewhat below the average, and especially for large orders.

In Cleveland, machine tool sellers are more optimistic than they have been for some time. A good volume of business has come in from all sections of Ohio, Michigan and the east. No large inquiries have come out, but the aggregate of small business is far ahead of that of last month. Calls for second hand machinery are rather numerous, and a fair amount of power plant equipment is being sold.

In Cincinnati, the machinery market is holding well to the slight spurt it took a month or so ago. Business the last three months has been about 3 per cent better than that of the preceding three months. The buying movement has spread from lathes to practically all machine tools. Orders for second hand machinery, coming from the south, have fallen off a trifle and electrical machinery is not selling any better than it was. Railroads are occasionally buying tools and it is reported one will be in the market soon for a large list to equip new shops to be built in central Kentucky.

Power Plant Equipment

Athens, Tenn., has voted to issue $38,000 of bonds to install an electric light plant and build a water system.

The borough of Sharon, Pa., has decided to build a municipal light plant at an estimated cost of $85,000.

A. J. Baker and J. H. Mays have begun the erection of a flour mill at Marion, Ky. Elevating and power equipment will be needed.

Improvements to their power plant are to be made by Palmer Bros., who operate the Diamond Coal Co., at Providence, Ky. Two boilers and an air compressor will be installed.

Wood-working and power machinery will be needed by the Racine Lumber Co., Racine, Wis., which will erect a planing mill of large capacity at Eddyville, Ky.

Machinery will be installed in the near future in the plant of the Marion, Ky., Electric Light & Ice Co. S. M. Jenkins, president of the company, is receiving estimates.

An additional generator will be installed in the electric light plant of the Halls Light, Water & Ice Co., Halls, Tenn., which has been purchased by James Z. George, Memphis, Tenn. The ice plant will also be improved by the installation of additional machinery.

A contract for 400 tons of structural steel for the power plant at Lowellville, O., has been awarded to the McClintic-Marshall Construction Co. by the Mahoning & Shenango Railway & Light Co. Construction on the new station is being rushed night and day and it is planned to begin the steel work within a short time.

Water Works

The municipal water works commission of Sheboygan, Wis., has decided to purchase a new pumping engine from the Fred M. Prescott Steam Pump Co., of Milwaukee, at $12,500.

Machine Tools

The Moran Flexible Steam Joint Co., 115 North Third street, Louisville, Ky., is in the market for a second hand milling machine.

The United States Light & Heating Co., Niagara Falls, N. Y., closed for some machine tool equipment for the extension to its plant that is being built.

The Safety Car Lighting & Heating Co. has placed orders for some of the machine tool equipment for the new building that is being erected in Jersey City, N. J.

The Buckeye Twist Drill Co., Alliance, O., successor to the Michigan Twist Drill Co., advises that it has made arrangements for all the new machinery it will require for its new plant. A goodly portion of the machinery is already installed.

New Construction

The Crucible Steel Co. of America is remodeling its plant at Syracuse, N. Y.

The Phillips Tool Co., Mannington, W. Va., is erecting a one-story brick and steel factory building. The foundation has been laid.

The Carnegie Steel Co. has announced it will remodel its 10-inch mill at Homestead, Pa., by the addition of two 14-inch roughing stands to facilitate the rolling of forging billets.

The Lumen Bearing Co., Buffalo, manufacturer of brass and aluminum castings, is extending its aluminum casting department by an addition which will cover an area of 1,800 square feet.

The Baker Motor Vehicle Co., Cleveland, maker of the Baker Electric cars, plans to erect a new factory at Toronto, Ont. The company advises it is unable to give definite information at this time.

The Pennsylvania railroad is building a two-story machine shop, 65 x

70 feet, near the west breakwater, at Cleveland. The shop is of steel construction. Complete machine shop equipment will be purchased.

The Woodward Iron Co., Woodward, Ala., is building a new furnace to replace one that proved too small. Work is being done by the Variety Iron & Steel Works Co., Cleveland.

E. J. Kreitzburg and John W. Emery are taking estimates on plans for a one-story rolling mill, 38 x 82 feet, on Powers lane, near Sussex avenue, for the Pennsylvania Flexible Metallic Tubing Co.

It is expected that the Germantown Tool Works, Germantown, Pa., shortly will award the contract for the group of seven buildings that will comprise the new plant to be erected at Second street and Ashdale avenue.

The International Hoist Co., Antigo, Wis., manufacturer of cranes, hoists, gasoline engines, etc., has broken ground for the first of the buildings which will comprise its new works at Antigo. The plant will cost about $75,000.

The Suspension Roller Bearing Co., Sandusky, O., advises that the size of its proposed plant will be 60 x 340 feet, and that its output will be anti-friction bearings for all purposes, shaft hangers complete, trolley wheels and hasps.

The Didier-March Co. advises that it has not perfected plans for the reconstruction of its buildings at Perth Amboy, N. J., which were destroyed by fire on the night of May 24. Work of redesigning is being pushed and it is expected to complete the plans within 30 days.

The Parkesburg Iron Co., Parkesburg, Pa., advises that it has placed a contract for an addition to its tube mill. It will be 85 x 175 feet, of steel construction, and served by overhead crane, and will be used to facilitate shipment of tubes, and to enlarge storage capacity of the works.

Winslow H. Robinson, tin, copper and sheet iron worker at 3 Prescott street, Worcester, Mass., has awarded William B. Richardson & Co. the contract for the erection of a building near his present shop. The new plant will be of brick construction, 55 x 162 feet, with concrete foundation. It will have three stories and a basement and will cost $50,000.

The Hoffman Engineering & Contracting Co. has been awarded a contract to erect a two-story machine shop, 140 x 458 feet, at the plant of the William Cramp & Sons Ship & Engine Building Co., Philadelphia. The cost of the extension is about $125,000. The McClintic-Marshall Construction Co. was recently awarded a contract to erect the steel work for the building.

The Nordyke & Marmon Co., Indianapolis, which manufactures automobiles and flour milling machinery, is extending its factory. A new office building, two stories, 43 by 155 feet, is being erected. Two additional stories are also being added to building "G," which is 52 by 243 feet. The company has been in business 60 years.

The Croxton Motor Co. will build an automobile factory at Washington, D. C. The building will be 120 x 500 feet, of brick and steel construction, plans calling for about 250 tons of steel. The main building will be one story and the office building two stories. H. O. Davidson, architect, the Caxton building, Cleveland, completed plans a few days ago.

The Ferro Machine & Foundry Co., 6811 Hubbard avenue, Cleveland, is completing a two-story building with basement, of reinforced concrete construction, costing $140,000. The addition will be used as a foundry. The company shortly will begin the erection of a reinforced concrete machine shop. This building will be three stories with basement, and will cost $190,000.

The Wausau Iron Works, Wausau, Wis., is spending $25,000 in new buildings and equipment. An addition, 100 x 200 feet, one story, is being built and will be used for the manufacture of tanks, boilers, bridges, structural steel, stacks, etc. Several cranes will be purchased. The company began business at Wausau five years ago as a branch of the Northern Boiler Structural Iron Works, of Appleton, Wis. Later the present company was organized as a separate institution. Officers are: President, F. W. Krause; vice president, Charles Wagner; secretary and treasurer, J. T. Schott; general manager, A. C. Heinzen.

The transfer recently to the Barry-Wehmiller Machinery Co. of a tract of 2.51 acres on the Terminal Belt line on Rosalie avenue, south of Marcus street, St. Louis, marked the conclusion of a factory location deal involving the purchase of $35,000 worth of real estate. The erection of a building to cost about $50,000 will follow at once. The Barry-Wehmiller Co. is one of the oldest machinery companies in St. Louis. Fred Wehmiller is president. The company has been in business previously at the southeast corner of Twenty-first and Eugenia streets but had no outlet by rail. The company produces machinery of every description.

The Duff Mfg. Co., of Pittsburgh, exclusive manufacturer of Barrett lifting jacks, has purchased five acres of ground on Preble avenue, northside, Pittsburgh, on the lines of the Pennsylvania and B. & O. railroads, and will start at once the erection of a factory, which, it is claimed, will be the largest in the world devoted exclusively to the manufacture of lifting jacks. The new site of the Duff Mfg. Co.'s factory, and that of the Pittsburgh Screw & Bolt Co., occupy the Riter Conley Co.'s property and adjacent acreage, totalling about 12 acres and is close to the plants of the Pressed Steel Car, the Standard Sanitary Mfg. Co., and the Edith furnace of the Carnegie Steel Co. The construction work on the factory and office buildings will commence about July 1. The Duff company's products are said to comprise the largest line of lifting jacks in the world, these jacks ranging in capacity from 1,000 pounds to those capable of lifting 500 tons and over.

Miscellaneous

The Baltimore Tube Co., Baltimore, has contracted with the Rockwell Furnace Co., New York, for the installation of large over-fired accurate temperature annealing furnaces for brass and copper tubing. Oil will be used as fuel.

The Oshkosh Gas Light Co., of Oshkosh, Wis., has awarded the contract for a 500,000 cubic foot holder, 100 x 100 feet in size, for its new water gas plant, to the Bartlett & Haywood Co., Chicago, Ill. William C. Baehr, Chicago, is consulting engineer.

The Ludlow Valve Co., Troy, N. Y., has been awarded a contract by the city of Pittsburgh for supplying valves for the extension of the Aspinwall pumping station for the city filtration plant. The contract includes an order for two 48-inch and four 36-inch flange valves, and four 42-inch and four 36-inch valves operated by waterproof motors.

The Westinghouse Electric & Mfg. Co., Pittsburgh, has closed a contract for the City Railway Co., at Los Angeles, Cal., to supply 54 double equipments for the traction service of that city. Another order calls for two double equipments for traction cars for the Tarentum, Brackenridge & Butler Street Railway Co., two quadruple equipments for the Fox & Illinois Union Railway Co., of Aurora, Ill. The Chicago City Railway Co. has ordered 125 double equipments for new traction cars. The Tyler Traction Co., of Tyler, O., has ordered five quadruple equipments and the Tractional Co., of New York City, has ordered 100 double equipments during the past week.

New Buyers

(In order to assist the post office in delivering letters to new concerns, it is suggested that the names of incorporators be written in the lower left hand part of every envelope addressed to such new companies.)

The following manufacturing companies have filed articles of incorporation:—

Pittsburgh Conveying Machinery Co., Pittsburgh; $100,000; by F. P. Sidenstricker, J. J. Conroy, A. P. Huckestein, Pittsburgh.

The J. R. Wood Supply Co., Cincinnati; $15,000; to manufacture mill, mine and foundry supplies; by J. R. Wood, Carl C. Port and D. G. Wiley.

The Flather Planer & Shaper Co., Lowell, Mass.; $30,000; to manufacture tools; by F. E. Dunbar and J. J. Rogers, Lowell.

The Robins-Long Machinery Co., Joplin, Mo.; $21,000; by J. R. Long, Alexander Robins, R. P. Robins and Byron Bourn.

The Egner Machine Co., Buffalo; $5,000; machinists; by Gustav A. Egner, William F. Egner and Martha Egner, all of Buffalo.

The Manufacturers Service Co., Manhattan, New York City; $10,000; to manufacture machinery and supplies; by Walter J. Minchan, Herbert Hantington and Daniel E. Meegan, all of Buffalo.

The Iron Co., Hartford, Conn.; $267,650; iron and metal goods of all kinds; by H. R. Von Wessley, E. M. Spencer and D. M. Scott, all of Hartford.

The New Metal Bed Co., Brooklyn, N. Y.; $2,000; metal and iron wares; by Abe Levine, 112 Madison street; Sall Katz, 551 First street, and Aaron Mazer, 162 Chester street, Brooklyn.

The Burkett Agricultural Works Co., Columbus, O.; $20,000; to manufacture and repair farming machinery; by John Burkett, Harry Lowrie and G. H. Robinson.

The Whitney Refrigerating Co., Manhattan, New York City; $40,000; to manufacture refrigerating machinery; by A. D. Stanton and F. W. Bailey.

Sharon Steel Building Co., Manhattan, New York City; $50,000; contracting and constructing; by Ramon J. Boera, and Joseph H. Chamaidan, 24 Stone street, New York City.

The Canfield Tank Line Co., Cleveland; $35,000; tank and freight cars; by George R. Canfield, J. A. Jackson, W. J. Renkel, P. R. McLean and H. M. Tucker.

The John Fuller Engineering Co., Manhattan, New York City; $200,000; machinists and tool makers; by John Fuller, 601 West 149th street, New York City; Arthur Lowy and Cleveland L. Frizelle.

The Newark Auto Truck Mfg. Co., 173 Frelinghuysen avenue, Newark, N. J.; $500,000; to manufacture auto trucks and motor vehicles; by L. W. Babbage, 776 Broad street, Newark; H. H. Poole and John T. Walsh.

The Graves & Marshall Co., Dayton, O.; $20,000; steam boilers, tanks, structural steel and iron work, etc.; by George L. Marshall, Henry C. Graves, William D. Graves, George W. Marshall, Gaylord L. Marshall.

The Magee Supply Co., Manhattan, New York City; $10,000; to manufacture machinery and supplies; by Chas. A. Allen, 114 Liberty street; Alonzo H. Magee, 106 Beekman street, and Chas. E. Francis, 92 William street, New York City.

The Waldon Aeroplane Co., Manhattan, New York City; $10,000; to build aeroplanes, etc.; by Joseph M. Gottesman, 600 West 155th street; Henry W. Waldon, 37½ St. Marks place; Louis Green, 292 Fifth avenue, all of New York City.

The Foreign Tool & Machinery Co., Manhattan, New York City; $5,000; to manufacture tools and machinery; by Katherine A. Woods, 373 Sixth avenue, and Margaret Sander, 226 Ridgewood avenue, Brooklyn; and Elvira Selmer, Hamilton Park, S. I., N. Y.

General Industrial

A contract has been awarded for a one-story brick and machine shop for the Ebensburg Coal Co., Colver, Pa.

The National Plating Mfg. Co., Louisville, Ky., has been incorporated with a capital stock of $1,000.

A charter has been granted to the Dolan Crucible Co., Philadelphia. The capitalization is given as $50,000.

The American Furnace Device Co., Baltimore, has increased its capital from $100,000 to $200,000.

The Henry Engineering Co., Manhattan, has been incorporated with a capital of $20,000. The company will make motors and machinery.

The Clark Bros. Co., Belmont, N. Y., plans to locate a plant for the manufacture of sawmill machinery at Olean, N. Y.

The Century Zinc Co., Manhattan, recently incorporated, advises that it expects to operate a small leased property in Missouri.

The Rochester & Pittsburgh Coal & Iron Co., Punxsutawney, Pa., has increased its indebtedness from $2,678,000 to $4,678,000.

The Punxsutawney Iron Co., Punxsutawney, Pa., has filed a notice of an increase in its capital from $150,000 to $300,000.

The Eastern Bridge & Structural Co., Worcester, Mass., has the contract to furnish the steel required for the construction of Temple Emanuel in Birmingham, Ala.

Notice has been filed with the Indiana secretary of state that the A. L. Greenberg Iron Co., Terre Haute, has increased its capital stock from $40,000 to $100,000.

A mortgage of $600,000 to the Philadelphia Trust Co. by the Southwark Foundry & Machine Co., which recently changed ownership, has been recorded.

The Park Motor Car Co., Cleveland, has filed notice of an increase in capital stock from $10,000 to $15,000, and a change in name to the Park Motor & Mfg. Co.

Change of plans by the Pittsburgh Crucible Steel Co., Pittsburgh, which is erecting an open-hearth department at Midland, Pa., will increase the number of furnaces from five to eight.

The Westmont Iron Foundry, Altoona, Pa., started operations for the first time last week by making its first castings. George Lebig is the owner.

The Armstrong Cork Co., Pittsburgh, is preparing plans for a new steel frame warehouse department,

which will be 10 stories high, 114 x 65 feet.

The Globe Seamless Steel Tubes Co., Milwaukee, has increased its capital stock from $650,000 to $1,000,000. The additional issue will be used for the extension of the business.

C. W. Hubbard, president of the American Axe & Tool Co., is organizing a company to manufacture forks and hoes, and is arranging for a site for the new plant in Beaver Falls, Pa.

The Variety Iron & Steel Works, Cleveland, denies a report that it is to build a new plant in the south. Officers of the company advise that no extension is contemplated at the present time.

The McClintic-Marshall Construction Co., Pittsburgh, has received an order for the steel structural work for electrifying the Stamford-New Haven division of the New York, New Haven & Hartford railroad.

The Harris Typewriter Co., of Fond du Lac, Wis., has started manufacturing operations and is now turning out several hundred machines per week. The entire output is taken by Sears, Roebuck & Co., of Chicago.

The Jefferson Electric Co., Brilliant, O., has been incorporated for $10,000 to generate electric light and power. The incorporators are Alonzo M. Snyder, Irvin K. Schnaitter, Roy R. Moffet, W. J. Budd and H. M. Roberts.

The Jacobson Iron Co., Toledo, O., dealer in scrap iron, metals, etc., has been incorporated with a capital of $10,000. The incorporators are Michael Jacobson, Louis Jacobson, John B. Crouch, Thomas C. Farrell and Lionel Levy.

Richard Markley, steward of the state hospital for the insane, Norristown, Pa., will furnish all information concerning the proposed addition to be made to the administration building and the erection of the hydrotherapeutic building.

The Frankfort Brass Works, Frankfort, Ind., has been sold by Braden Clark, trustee of the factory, who was appointed by the federal court. Attorney H. F. White, of Chicago, representing the Great Western Smelting Co., purchased the plant for $6,000.

The Mansfield Foundry & Mfg. Co., Mansfield, O., has been incorporated with a capital stock of $10,000, to engage in a general foundry business. The incorporators are Harry L. Krumm, Oscar G. Jacob, Sarah E. Krumm, Helen M. Jacob and Arthur C. Jacob.

The Buffalo Bridge Co., Buffalo, has closed a contract to furnish steel and do the erecting for the following buildings: The Normal Park Methodist church; the Robb building, Connecticut street; the Y. M. C. A. building at Batavia, N. Y., and the Harriton building, William street.

A few days ago the Noelke-Richards Iron Works completed its contract for fabricating and erecting the structural steel for the 16-story Merchants' National bank building, Indianapolis. The contract involved 3,020 tons of steel, one of the largest contracts of its kind in the city in many years.

A line of machinery will be manufactured by the newly organized Deister Machine Co., Fort Wayne, Ind., which has been incorporated with an authorized capitalization of $200,000. Those interested in the company are Emil Deister, W. F. Deister and E. G. Hoffman.

The Pierson Reciprotary Motor Co., Brooklyn, N. Y., recently incorporated, advises that it is not yet ready for business. Its various patents have been allowed, but not issued, and until its motor has been thoroughly tested to the entire satisfaction of the company, no statements will be issued to the trade.

Two acres of land south of the plant of the Allegheny Glass Co., Glassmere, Pa., have been sold to a company of men of that town who plan to erect an iron and steel casting plant with machine shop. Plans for the new plant are being prepared, and it is understood that electric power will be used exclusively.

The Holder Welding Equipment Co., Brooklyn, recently incorporated, advises that it will manufacture acetylene generators, oxy-acetylene torches, cutting apparatus, regulators, etc., and will make complete acetylene equipment for welding purposes. Its output will average about ten complete welding outfits each week.

The Republic Chemical Co., composed of eastern men, has purchased 600 acres of land on Neville Island, adjacent to Pittsburgh and near the Des Moines Bridge & Iron Works plants, and is preparing plans for a plant to cost about $250,000. The company will employ about 200 men at the outset.

The Cramp & Sons Ship & Engine Building Co., Philadelphia, is in the market for considerable standard and special shop equipment. The company has closed for a number of traveling cranes, for installation in the machine shop building, which has recently been contracted for. The building will be 140 x 458 feet.

The Stanley Mfg. Co., Niles, O., has commenced extensive additions to its plant, which include three buildings, one 72 x 144 feet, a second 49 x 50 feet and a warehouse 80 x 104 feet. Also an extension to the crane runway of 150 feet. McClintic-Marshall Construction Co., Pittsburgh, has the structural contract on these buildings.

The Hewitt Bearing Metal Co., Newark, N. J., recently incorporated, is manufacturing bronze bearing metals and brass and bronze composition and aluminum castings. It occupies a building 50 x 100 feet, one and two stories, equipped with four furnaces, lathes, grinders, etc. James Hewitt is president and Edgar A. Moree is manager.

The manufacturing property of the Eureka Foundry Co., Cincinnati, was bought at a sheriff's sale last week, by the Cosmopolitan Bank & Savings Co., also of Cincinnati, for $30,000. The realty was sold separately for $1,055. The full appraisement was $45,000. The purchasing company was the plaintiff recently in a suit against the Eureka company.

The Kansas City Aluminum Mfg. Co., Kansas City, Mo., recently incorporated for $10,000, advises that it is engaged in the manufacture of aluminum kitchen utensils and specialties and will also handle aluminum job work. Equipment is being added as fast as possible. G. M. Babst is president of the company and R. Best is secretary and treasurer.

The chattels of the Phillemac Rolling Mill Co., at Glendale, O., near Cincinnati, were sold at auction last week, for a total of $8,200, separate lots being bought by scrap iron dealers from Cincinnati, St. Louis, Dayton, Pittsburgh and Youngstown, O. The Phillemac company has been running a small bar mill under a receiver until a short time ago, when the plant was closed.

The Marion Motor Car Co., Indianapolis, Ind., has been organized recently, and has been re-incorporated with an authorized capitalization of $1,250,000. J. I. Handley, president of the American Motors Co., is president of the new company, which has also taken over the Marion Sales Co. Additional factory buildings are to be erected at a cost of $100,000. John N. Willys, president of the Willys-Overland Co., Toledo, O., is a heavy stock holder in the re-organized company.

A general jobbing and manufacturing business in machines and wire will be conducted by the Indiana Machine & Wire Co., which has just been organized and incorporated at Indianapolis with a capitalization of $30,000. Those interested in the com-

pany are George Whittington, 631 North New Jersey street; Fay H. Irwin, 156 W. Pratt street, a clerk in the State House, and Millard F. Cox, 2201 N. New Jersey street, secretary of the state board of accounts.

The plant of the Beaver Dam Foundry Co., at Beaver Dam, Wis., has been re-opened after a month's idleness and is preparing for a brisk season. The company has just closed with the Love Brake Shoe Co., of Chicago, for a two years' supply of brake shoes, the order amounting to 400 tons of finished material per month. The company will be obliged to extend the plant to take care of this order in addition to its regular business. Details have not been completed by the board of directors.

The Youngstown Bronze & Iron Co., Youngstown, O., has increased its capital stock from $50,000 to $65,000. The increase in the capitalization is the result of the natural growth of the business and no changes in the workings of the firm are contemplated. A number of improvements have been made within the past year and several additions to the buildings erected. The company at present is making all kinds of castings from 30 tons down with a specialty of light gray castings.

The Reliance Coke Co., 400 German National Bank building, Pittsburgh, has been incorporated and the following officers elected: President, H. C. Fownes; vice president, W. C. Fownes; secretary and treasurer, W. C. Fownes Jr. This company will immediately start development of 600 acres of coking coal at Denbeau station on the P. V. & C. division of the P. R. R. near Brownsville, Pa. Two hundred and fifty rectangular ovens will be built and a modern coke plant will be in operation about the first of the year.

The George W. Johnson Co., manufacturer of iron and steel fire escapes and fireproof doors, which bought the property at No. 1210 South Eighth street, St. Louis. several weeks ago, has started its plant with 50 employes. The company was induced by T. P. Bates, industrial commissioner of the Business Men's League, to move its business from Kansas City to St. Louis. Frank Baumbarger will manage the plant. The property bought by the company is a two-story building on a lot 50 x 100 feet. It was formerly used for factory purposes.

The Quincy Engine Co., Quincy, Pa., manufacturer of stationary, portable and traction gasoline engines, advises that it has increased its indebtedness from nothing to $25,000 for the purpose of enlarging its facilities by adding to its present buildings and installing new machinery. The company is not prepared at this time to give any information as to the dimensions of the new buildings to be erected and the kind of machinery to be installed, as the matter has not been fully determined. It probably will be a month before conclusions are reached.

The New Castle Steel & Iron Co. has applied for a charter under the laws of Ohio, with W. H. Schoen, E. N. Ohl, George P. Rhodes and A. B. Berger, of Pittsburgh, as incorporators. This company is expected to take over the property of the defunct New Castle Forge & Bolt Works, New Castle, Pa., which was sold under foreclosure recently, and will take up plans for building a steel car plant with a capacity of 12 cars a day as well as other car specialties. The decision as to the final plans is expected within the next ten days.

The Seberg Mining & Mfg. Co., of Racine, Wis., organized some time ago with a capital stock of $1,000,000, at the first general meeting of stockholders, elected these directors: Frederick Osius, M. O. Senseny, W. D. Thompson, Frank Alshuler and Gustave Seberg. It was decided to change the name of the corporation to the Seberg Tunnel & Planing Co., which more nearly expresses the object. The company will build mining, excavating and tunneling machinery designed by Mr. Seberg. Exhaustive tests are being made in stone quarries at Racine. Mr. Seberg is now working on a planing machine to cut rock surfaces, such as pavements, to a smooth surface.

The Cotta Gear Mfg. Co., Rockford, Ill., recently incorporated, advises that it has been organized with a capital of $100,000, half of which has been paid in. The company has been in business for about one year. Under its new organization, the following officers have been elected: President, P. A. Peterson; vice president, F. W. Lindgren; secretary and treasurer, L. Faust. The object of the company is to manufacture the "Cotta Short Series" individual clutch transmissions and automobile parts in general. At present, the company occupies a considerable floor space in the factory of the Mechanics' Machine Co., and in the near future may erect a building of its own.

Advising in regard to a recent fire, the Lion Motor Car Co., Adrian, Mich., says its plant was totally destroyed, the loss being between $350,000 and $400,000, with an insurance of $180,000. Every indication points to the immediate rebuilding of the plant. The company feels confident that the shutdown which the fire necessarily enforced will be of very short duration. Preparations are being made to go ahead as soon as the necessary arrangements can be made. It is thought by the company that it will be only about two weeks behind on its shipment of the new "30" cars, which it is making ready to put on the market. The company is not in a position to give any information regarding plans for its proposed new factory.

The European office of the American Electric Furnace Co., 45 Wall street, New York City, has sold to the Peiner Rolling Mills, Germany, a four-ton, Roechling-Rodenhauser, electric induction furnace for melting ferro-manganese. This furnace is provided with the figure 8-shaped hearth, but instead of a one or three-phase, it operates on a two-phase current, at 9,400 volts. The ferro is charged from the electric furnace direct to the basic Bessemer converters, since previous tests at Volklingen and at Rombach, in Germany, have shown that the charging of molten ferro bring about a saving of from 30 to 35 per cent of this alloy. The cost of melting in the electric furnace, including all charges, is about $6 per ton of ferro.

The Siemund Wenzel Electric Welding Co., Washington, D. C., which proposes to establish welding plants at the ports of Savannah, Ga., New Orleans, and Galveston, Tex., advises that the plants are to be exclusively floating equipments; that is, they will be established upon a barge that can be taken around the ports for the purpose of making repairs on marine work particularly. The company is especially interested in internal combustion fuel oil engines and motor generator sets, such as will take any existing power established in shops where the company proposes to install machines in the railroad line and machine shops generally. Only belt driven direct current generators are to be used on the barge. For this purpose the company has always used 25-horsepower 16-kilowatt direct current generators, but for stationary shops both alternating and direct current is used, which makes the difference in the equipment.

Trade Notes

The Chicago Pneumatic Tool Co. has opened offices at 1400 Majestic building, Milwaukee. Harry B. Shippy is in charge of the office.

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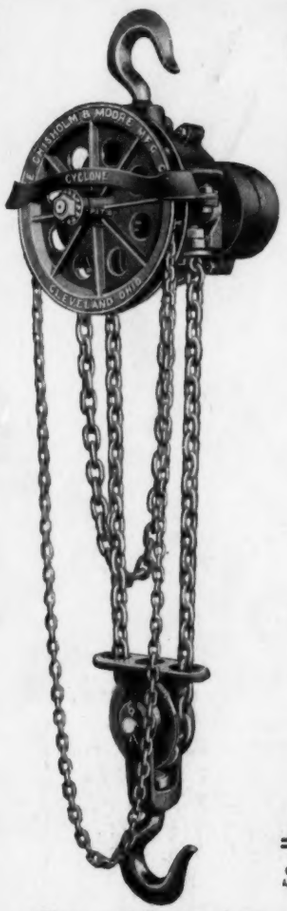

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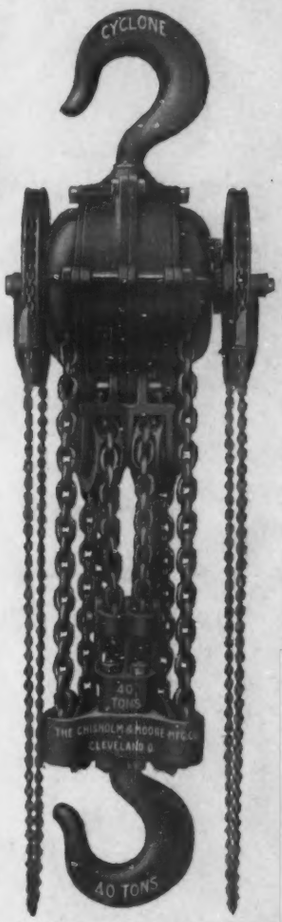

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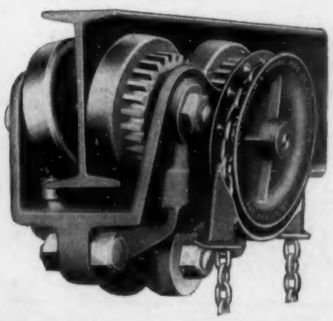

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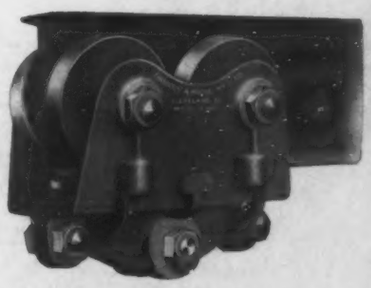

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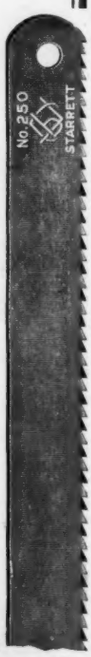

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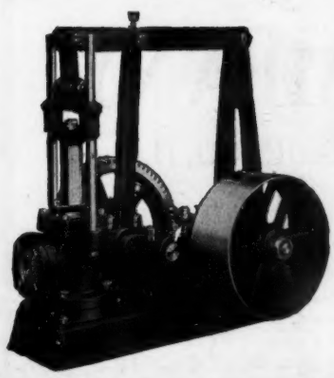

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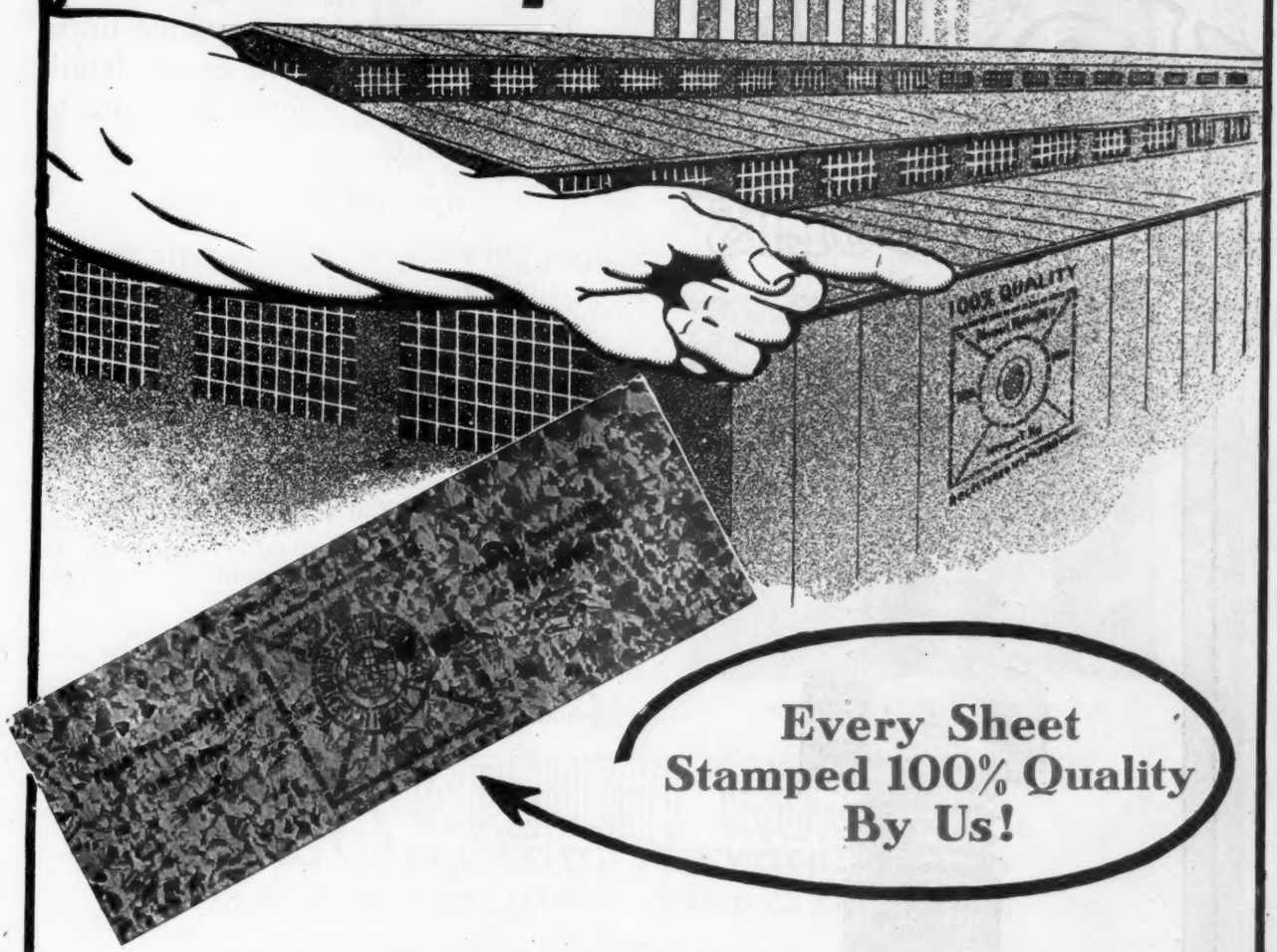

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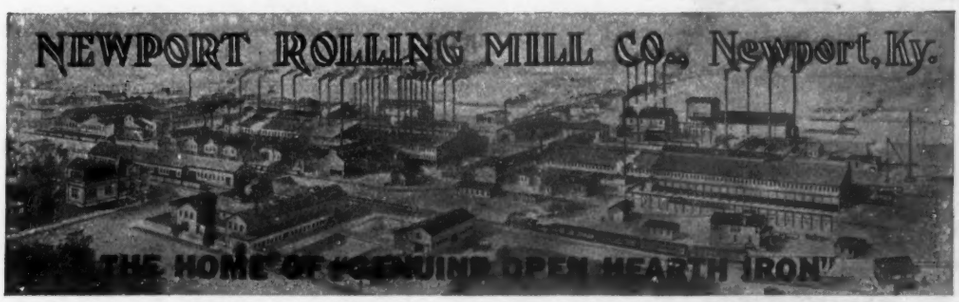
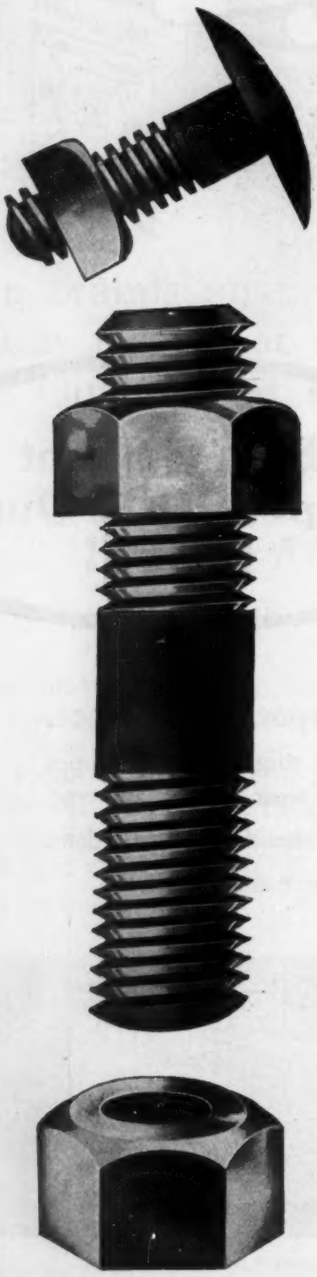


NUTS

UPSON

BOLTS



THE superior finish of every Upson nut or bolt is one of the strong arguments of quality that is based on many years of manufacturing experiences.

It presupposes an insistance upon the most minute care in every detail, and facilities that extend from ore to finished product.

Every Step Complete in the Upson Works

Nuts and Bolts—Every Kind, Every Size, for Every Purpose

Axle-Clips, Hame-Clips, Clip-Yokes, etc.

UNION Boiler and Structural Rivets, ½-inch and larger; also a complete line of smaller rivets for other purposes.

Rules, Belt-Fasteners, Washers, etc., etc.

For more complete list consult our catalog, sent on application.

THE
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Bolts Nuts Rivets
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Good Couplings Are as Important as Good Pipe

IN the A. M. Byers plant just as much care is given to the couplings or "sockets," as to the pipe.

They are made of the same high-grade wrought-iron, without admixture of scrap.

They are rolled—not hammered—producing a better weld and a more uniform socket.

They are carefully threaded to correspond accurately with the threading on the end of the pipe.

In all sizes where the thread on the pipe is tapered the coupling is tapered to make the thread an absolute fit.

This extreme care in threading increases expense, but is one of the things that make the water-tight, gas-tight, steam-tight and oil-tight joints of

Making the rolled couplings or "sockets" for A. M. Byers guaranteed full-weight wrought-iron pipe

One of the big "taper taps" that cuts the threads in the Byers pipe couplings

BYERS WROUGHT IRON PIPE
GUARANTEED FULL WEIGHT

LINE-PIPE OIL-WELL CASING X AND XX STRONG PIPE

Write for booklet "The Control of Quality in Every Process." It describes every step in manufacture, from mine to shipping platform.

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BOURNE-FULLER CO
Iron, Steel
Pig-Iron
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Pittsburgh **Cincinnati**
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VISMERA WINS!

Wherever a metal worker takes the trouble to compare analyses—**VISMERA wins!**

Wherever a metal worker compares the workability, the strength and toughness of competing metals—**VISMERA wins!**

Wherever a metal worker subjects competing ferrous "rust-resisting" sheet metals to the accelerated acid test, the salt-brine test, the wet-sand test, the wet-and-dry test—**VISMERA wins!**

Wherever a metal worker takes the trouble to investigate the difference between the use of common scrap iron and the use of new Inland Open Hearth Crop-end in conjunction with Pig iron—**VISMERA wins!**

The more rigid the tests, the more searching the inquiry, the more surely **VISMERA wins!**

VISMERA SHEETS

Black or Galvanized—
Defy Rust and Corrosion

The more a man knows about iron and steel, and the value of copper and manganese as alloys, the more sure we are to win his endorsement and his business.

The day of "mystery" in rust-resisting ferrous sheet metals is past. The "Inland" search-light sent a lot of spooks to cover, and now opened eyes are demanding authentic analyses with each shipment of the once mysterious "iron" or "metal" sheets.

Such an analysis accompanies every shipment of Vismera—automatically—without the asking.

99.932 PURE METAL

That was the analysis of an average heat, on an actual shipment in regular course to an Iowa customer. Sometimes it goes a little higher, sometimes a little lower; but it never varies greatly, because VISMERA is made from our own strong Northern pig iron melted in our own blast furnaces at Indiana Harbor and combined with known quantities of NEW mill crop-ends of known analysis.

No such uniformity is possible with mills whose "fancy" products are made largely from cheap scrap iron and steel—a product whose actual quantitative analysis can never be obtained and whose very character makes uniformity impossible.

Let us tell you more about Vismera, a new and better product which we offer black and galvanized—in all standard gauges and sizes.

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Branch Offices: ST PAUL Pioneer Building · ST. LOUIS Nat'l Bank of Commerce Bldg. · DENVER 1618 Stout Street · DALLAS Praetorian Building · MADISON, WIS. 929 Spaight Street · KANSAS CITY R. A. Long Bldg

THE YOUNGSTOWN SHEET AND TUBE COMPANY

YOUNGSTOWN, OHIO.

BUCKEYE FENCE

GALVANIZED SHEETS

PUDDLED Iron is not expensive. We can furnish Genuine Old Fashioned Puddled Iron Roofing, well painted, at about the same price as Galvanized Steel.

¶ The puddled iron, used for roofing or siding, will outwear the steel two or three for one. We say this without prejudice because we make a great deal more steel than iron. When we build a new building at our works, we roof it with iron because we know by so doing, we are saving money. We believe there are no better galvanized steel sheets made than our famous "New Process", but we just as firmly believe that they are inferior to puddled iron when used for roofing purposes.

¶ Our Genuine Puddled Iron Sheets are honestly made. We stand behind that statement with all of our business reputation. You are welcome to come and see them made at any time.

DOUBLE REFINED PUDDLED IRON ROOFING

DISTRICT SALES OFFICES

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STAR IRON BRAND PIPE

Y STEEL BRAND

SCULLY SERVICE

IF you want steel for any purpose, wire SCULLY. We don't care where you are---nor how far away---just so you are between the Atlantic and the Pacific, British Columbia and the Gulf of Mexico. Railroads go everywhere. We'll get the stuff to you. You can bank on it.

SCULLY STEEL & IRON COMPANY
CHICAGO, ILL.

Here's Why Here's Why

Sheet Metal

TONCAN METAL

works on classical architecture.

The Weather and Substitute Roofing

The recent severe cold weather has again demonstrated the futility of using substitute materials for such purposes as roofing and siding. Following a protracted period of comparatively warm weather the recent cold snap has caused so-called asbestos shingles and composition shingles to curl up at the edges. This curling springs the nails out and leaves the shingles a prey to every gust of wind that blows.

Owners of houses with sheet metal roofs can complacently endure the weather, serene in the knowledge that their roofs are really weatherproof.

Sheet Metal and the Fire Hazard

EXTRACT FROM THE SHEET METAL SHOP JAN. 1912

RUST-RESISTING ANTI-CORROSIVE AND DURABLE

That TONCAN METAL is really weather-proof and the most adaptable material for all exposed sheet metal purposes has been proven by years of actual service.

Its purity, density and homogeneity have made it the invariable choice where put to comparative test with other sheet metals.

The exacting engineer is not satisfied with mere statements concerning new and untried sheets—he cannot afford to experiment with every innovation in the line of sheet metal.

That's why the majority of the country's largest manufacturers use TONCAN METAL exclusively for roofing, siding, and for all exposed surfaces.

Ask for a copy of "A Return to Ancient Virtues." Write today for it—it's sent free and it's instructive and mighty interesting.

THE STARK ROLLING MILL CO. CANTON OHIO

Another Reason–

Twenty-five successive years in the manufacture of Galvanized Sheets is an assurance that your orders are in the hands of experienced makers.

It also means **Quality**—the best reason why you should specify exclusively for

APOLLO BEST BLOOM
Galvanized Sheets

"A Product Without A Peer"

American Sheet and Tin Plate Company
General Offices: Frick Building, Pittsburgh, Pa.

Manufacturers of SHEET AND TIN MILL PRODUCTS of Every Description

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SHEETS - PLATES

HOT PRESSED STAMPINGS

BOILER TUBES

LOCOMOTIVE FLUES

STEEL CASTINGS

AMERICAN INGOT IRON AND STEEL

Licensed under International Metal Products Company's Patents.

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Commercial Nat'l Bank Bldg., Chicago
1100 3rd Nat. Bank Bldg., St. Louis

Supremacy

Samples exposed daily for one hour to fumes of sulphurous and sulphuric oxides in a moisture laden atmosphere, and during the remainder of the time to moist air of a fume closet for 169 days.

Plain Steel	lost	1156	grains	per	sq.	ft. surface.
Pure Iron, Black	"	996	"	"	"	"
Galvanized Steel	"	497	"	"	"	"
Tinned Steel	"	575	"	"	"	"
Terne Plate	"	274	"	"	"	"
"CISCO LED-KOTE"	"	110	"	"	"	"

Steel sheet of a considerably lighter gauge than the pure iron black, was practically all gone. Coating on Galvanized was entirely gone and sheet badly rusted. Tin and Terne Plate also showed up very badly.

The Coating of Cisco Led-Kote was Intact

There would have been no loss had not edges of Cisco Led-Kote samples been cut, and therefore not coated.

There is no roofing material made as durable or as good as

Cisco Led-Kote

You can't damage the coating. It is there to stay.

Send for booklet. Be convinced.

The Cincinnati Iron & Steel Company

CINCINNATI, OHIO

Iron *Steel* *Machinery*

LA BELLE

"Hain't goin' to be no core," said the boy hard pressed for that coveted remnant of his apple.

He could use all of it very nicely.

That's the secret of the popularity with metal workers of

La Belle Open Hearth Steel Sheets

They are uniform in quality in every sheet---whether you buy them by the square or pound.

By working with least waste, they represent most money's worth.

Black, Galvanized or Painted.

"From Mine to Market"

La Belle Iron Works

General Offices, Steubenville, O.

Works: Steubenville, O.

Works: Wheeling, W. Va.

The Finger of Pride

is pointed to the Tin Roofing applied 40 years ago, which is still doing service and in as good condition as the day it was put on.

Armco Old Style and Armco Extra Coated Terne Plates

MADE FROM GENUINE

AMERICAN INGOT IRON

Will last just as long

BECAUSE

They possess the same pure iron base as the iron of our forefathers, which made the old-fashioned terne plate so durable.

Obtain full prices to-day on the best Terne Plates Manufactured.

Don't accept any more substitutes when you can have the real article.

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The American Rolling Mill Co.

MIDDLETOWN, OHIO

Licensed Manufacturers Under The International Metal Products Company's Patents

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Use Our Titanium Alloy

in the right way (always without aluminum) and you will find your product proving remarkably free from flaws, simply because Titanium Alloy removes the causes.

You know that Nitrogen gas will creep in and cause that deadly ailment, "brittleness." You know that Oxygen, so active in producing rust, is hard to keep out, and that both gases are likely to honeycomb the metal with blowholes. You know, too, that segregation of solid impurities weakens the metal and starts electrolytic corrosion.

On the other hand, any maker of iron and steel who uses Titanium Alloy will tell you that it prevents brittleness and blowholes—that it thoroughly purges the metal from solid impurities—that it reduces segregation—that it remarkably increases durability of iron and steel, and makes the metal uniform in quality. We will be pleased to prove all these claims to *your* satisfaction.

Increased facilities and enormous output have made possible a 20% reduction in prices. So now you can make Titanium Steel at an extra cost ranging from 50c to $3 (per gross ton of product), depending upon amount of alloy used. Cost for Titanium Iron ranges from 25c upwards.

Output of Titanium Steel in 1910 was 326,300 gross tons.
Output of Titanium Steel in 1911 was 410,600 gross tons.

Unbiased Opinions of Titanium Alloy

"The presence of Titanium Oxide lowers the melting point of slags occluded in iron and steel, and imparts thereto sufficient fluidity to account for their elimination."
—PROF. BRADLEY STOUGHTON,
Author "The Metallurgy of Iron and Steel."

"Titanium introduced as an alloy at once combines with the gaseous nitrogen present in the molten metal, forming a stable nitride. It is the formation of this stable nitride which prevents blowholes, and thereby produces solid ingots or castings."
—DR. F. C. WEBER.

"The combination of Titanium with nitrogen is attended with the evolution of heat. It is the *only* indisputable example of the combustion of an element in nitrogen."—MOISSAN,
Celebrated French Chemist.

You should read our Booklet No. 27 for more information about Titanium Alloy. Sent free.

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THE PRIMOS CHEMICAL CO.
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square steel bars for concrete reinforcement

Twisted Cold

60,000 lbs. Elastic Limit

The primary requirement of a reinforcing bar, and that upon which the engineer bases his calculations, is a high Elastic Limit. It is precisely in this feature that our COLD TWISTED SQUARE STEEL BAR surpasses all other concrete bars.

Our COLD TWISTED square bars are warranted to bend around a diameter **three** times the size of the section.

We manufacture all sizes from ¼" to 1½", increasing by 16ths.

Lengths up to 40 feet. Longer bars by special arrangements.

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JONES & LAUGHLIN STEEL COMPANY

AMERICAN IRON & STEEL WORKS

PITTSBURGH

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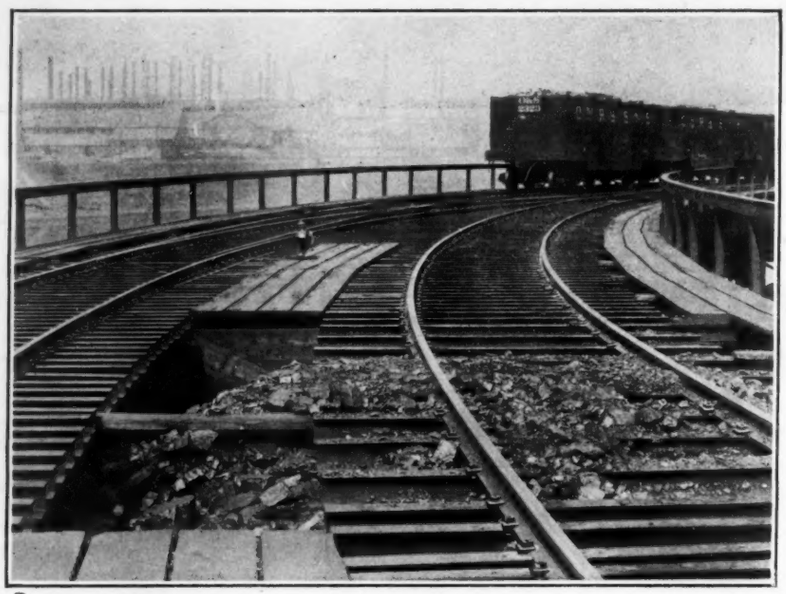
Carnegie Steel Company

General Offices, Pittsburgh, Pa.



STEEL CROSS TIES

used on trestles have proven the best safeguard against accidents and fire.

It will pay you to use them.

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EXPORT REPRESENTATIVES:
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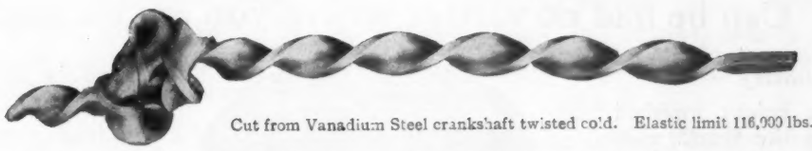
VANADIUM

The Steel of Ultimate Quality

Elasticity Strength Toughness Endurance



Cut from Vanadium Steel crankshaft twisted cold. Elastic limit 116,000 lbs.

Vanadium is the only element that greatly increases the elastic limit and dynamic strength of steel without impairing its ductility. Vanadium Steel forges, machines, welds, case-hardens and responds to heat treatment better than other steels that do not possess its manifold advantages.

Booklets and expert advice on application.

"Amervan" and "Masvan" Ferro-Vanadium are the standard alloys for making Vanadium Steel.

American Vanadium Company

Largest Manufacturers of Vanadium Alloys in the World **Immediate Shipment any quantity**

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LONDON PARIS PITTSBURGH

Structural Shapes — Plates — Bars
Small Shapes

We now have in our new warehouse a large stock from which we are filling orders immediately upon receipt

Stock Sheets mailed regularly to those interested.

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FORGING AND WELDING STEEL

An **Open Hearth Steel,** for Forging and Welding, carbon .30 to .40, sulphur and phosphorus under .05. You'll be satisfied if you give us a trial order. Write us now.

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Quality and Delivery **SERVICE**

Can be had no matter where you are located.

***Regarding Quality*—**

The Largest Bright Finished Steel Mill in the World, with unequaled facilities combined with years of experience as shafting manufacturers, assures you ONLY THE BEST.

Philadelphia Warehouse

***Regarding Service*—**

Large, well stocked warehouses, carrying an assortment of sizes of Cold Drawn Shafting and Screw Stock, located at central points, give you delivery at your door.

Better delivery is impossible.

Facilities for executing orders for special shapes are unequaled. Send us your specifications and get UNION DRAWN SERVICE.

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Plain and Twisted Concrete Bars

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Agricultural Shapes

To Authors

¶ *We invite your attention to the fact that we desire correspondence with authors, or prospective authors of books on iron, steel, machinery and foundry subjects, with a view to their publication, with our imprint.*

¶ *As publishers of The Iron Trade Review and The Foundry, our publications alone insure a wide advertising of every book issued by this house, among a very high and specially interested class of people.*

The Penton Publishing Co.

Cleveland

SHELBY SEAMLESS COLD-DRAWN STEEL TUBING

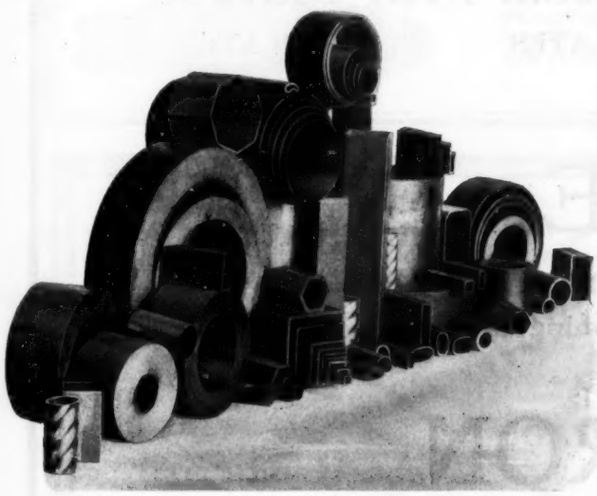
MAKE AN INVESTIGATION

¶ Many people are acquainted in a general way with Shelby Seamless Cold-Drawn Steel Tubing, but think its use begins and ends with the manufacture of automobile parts, bicycle frames or for similar purposes.

¶ Shelby Seamless Steel Tubing was first introduced into the market as a successful commodity through the evolution of the bicycle. However, very soon the remarkable adaptability was easily apparent to the early users, and from the initial application there has been a steadily growing list of uses which today seems but in its infancy.

¶ This "List of Uses" (ask for a copy) includes, not alone the pioneer adaptations of this superior product, but also many of the latest applications which indicate that Shelby Seamless Cold-Draw Steel Tubing is an important factor in the successful operation of thousands of mechanical devices, many of which owe their existence, primarily, to the uniformity, ductility and strength of this material.

¶ Where metal tubing is used—where solid stock is bored or forged it is a mistake not to investigate the merits of Shelby Seamless Cold-Drawn Steel Tubing, for it will prove to be, not only better, but more economical.



Various Shapes of Shelby Tubing Now Being Used

SHELBY ADVANTAGES

(1) The tube is steel of a special high grade.

(2) The tube is seamless, light and strong.

(3) The tube is either cold-drawn or hot rolled.

(4) The tube is smooth and accurate to gage.

(5) The tube is annealed to specification.

(6) The tube is raw material or finished product

(7) The tube is made small as a needle.

(8) The tube is made up to 20 inches in diameter.

¶ We've a booklet, **"Shelby Steel Tubes And Their Making,"** which tells the whole story of a remarkable manufacturing process and describes the many uses to which this superior product can be applied. It is not for general distribution, but will be sent free to anyone genuinely interested.

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Open Hearth Bessemer STEEL

Billets, Blooms, Slabs, Sheets, Bars

Merchant Bars, Shapes, Skelp, Polished Shafting, Old Rail Bars, Special Sections, Mine Rails, Twisted Squares, Merchant Bar Iron, Spikes, Bolts, Nuts, Washers, Turnbuckles.

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BOILER PLATES FLANGE PLATES TANK PLATES

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Merchant and Full Weight. Black and Galvanized.
Line Pipe, Drive Pipe, Tubing and Casing.

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Northern Foundry. Sand and Chilled Bessemer.
"Pioneer" Southern. Foundry and Basic.

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OPEN HEARTH STEEL

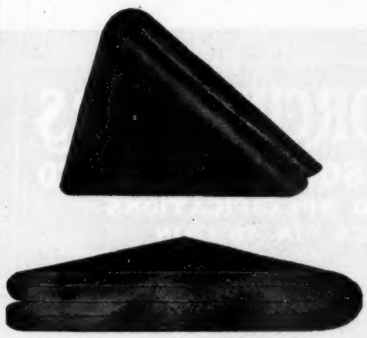
OR

PORTSMOUTH IRON

in Sheared Plates and Blue Annealed Sheets

O. P. C. R. Black and Galvanized Sheets

Galvanized Roofings



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Flanged and Dished Boiler Heads.

Saddles, Manholes, Furnace Holes, etc.

WORTH BROS CO.
MANUFACTURERS
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Irregular Heads for Marine Work.

Boiler Tubes Steel Plates and Sheets.

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WORKS: Garston Docks. CODES: A. B. C., Moreing and Neal, Lieber's and Western Union.
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FLUOR SPAR—The Pennsylvania Salt Mfg. Co., Pittsburgh, Pa.

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We make any and EVERY ALLOY AND METAL REQUIRED
We make a SPECIAL HIGH SPEED ALLOY FOR TOOL STEEL

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Improves with Age

The quality of **Chrome Vanadium Steel** depends entirely upon the experience of its manufacturer.

When we first began to manufacture

CHROME VANADIUM STEEL

we were without competition.

Since we **"blazed the trail"** it naturally follows that we have reached a more distant point in the mysteries of the successful manufacture of **Chrome Vanadium Steel** which is made under our secret process, patents for which are now pending.

Why not

Profit by our experience

Drop us a line for some

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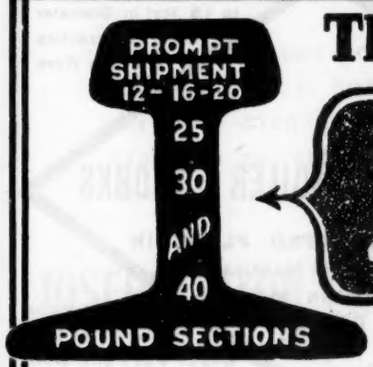

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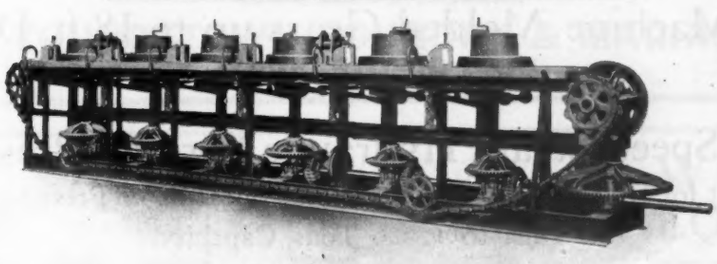

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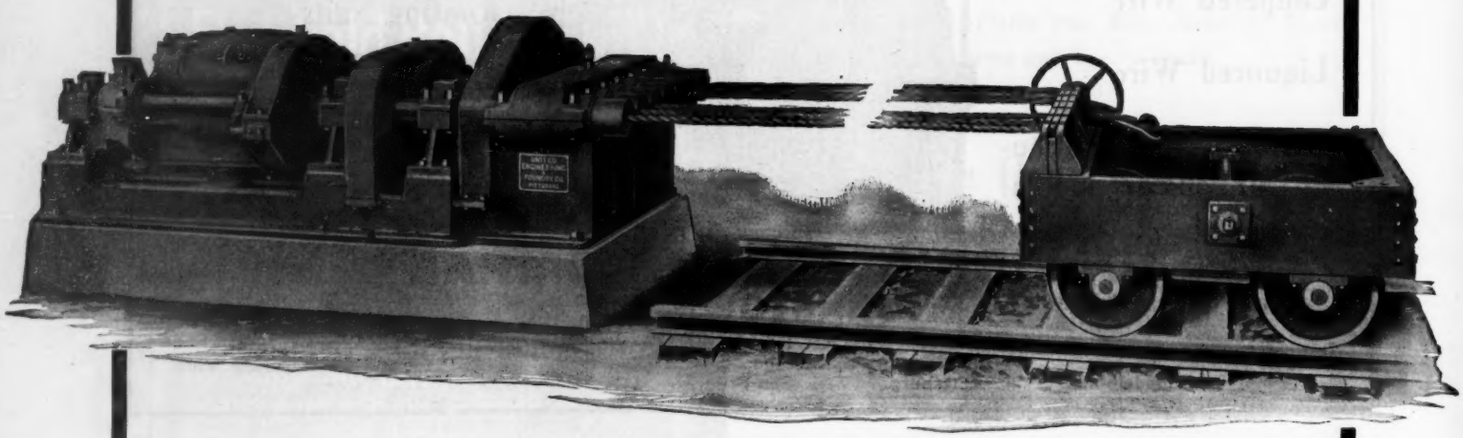

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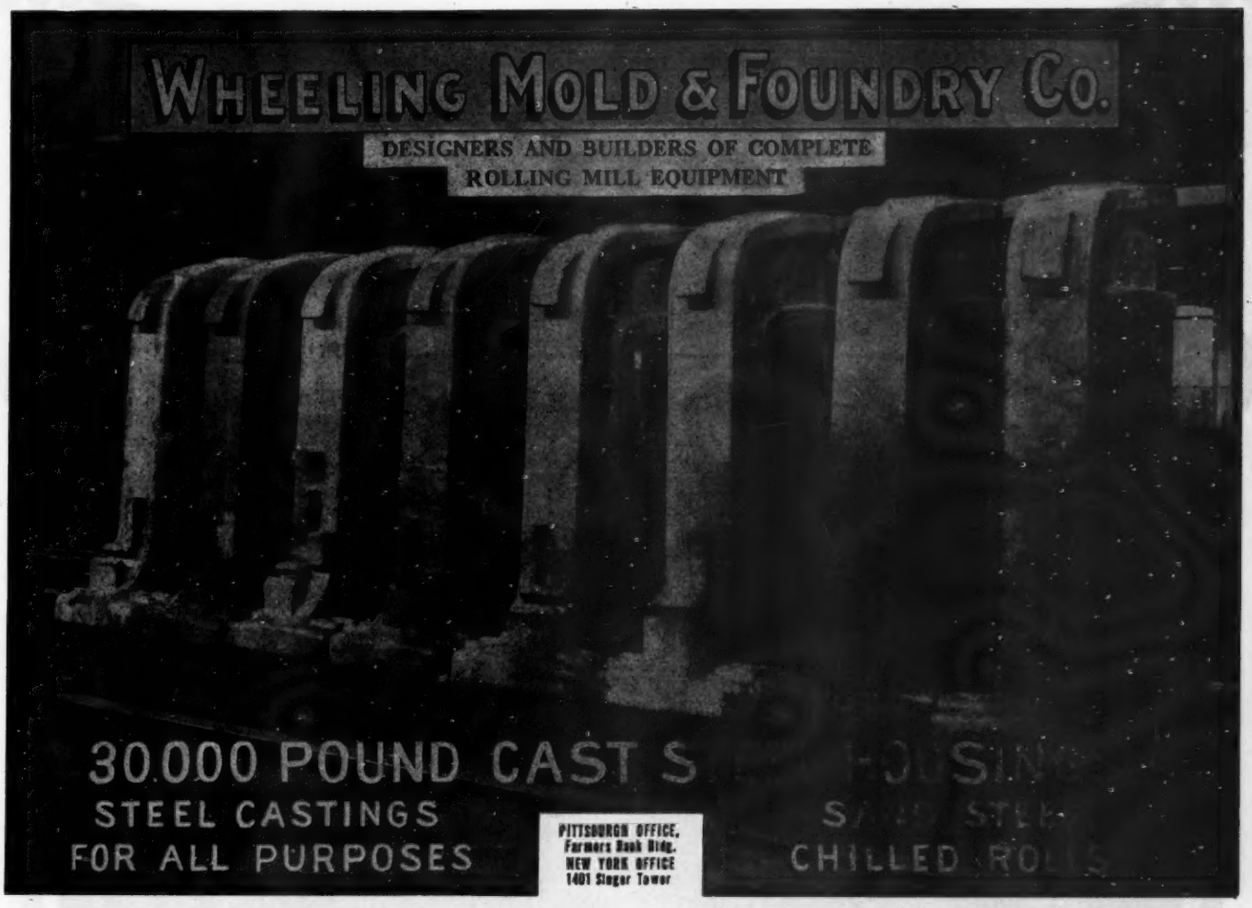

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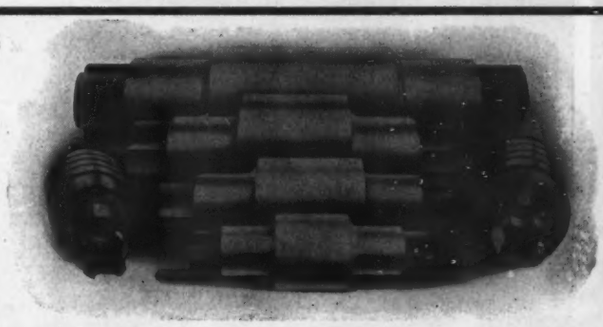

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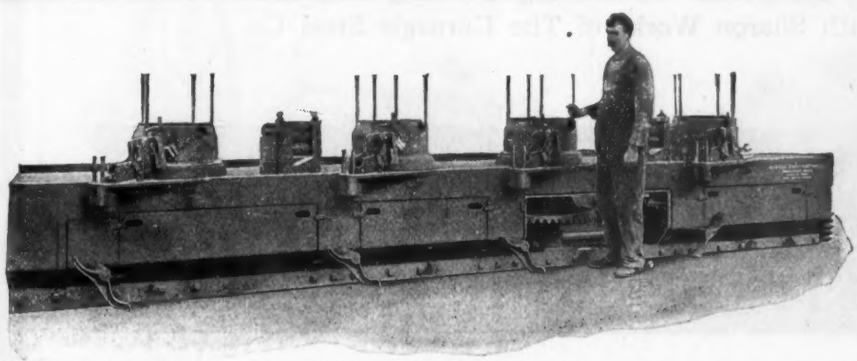

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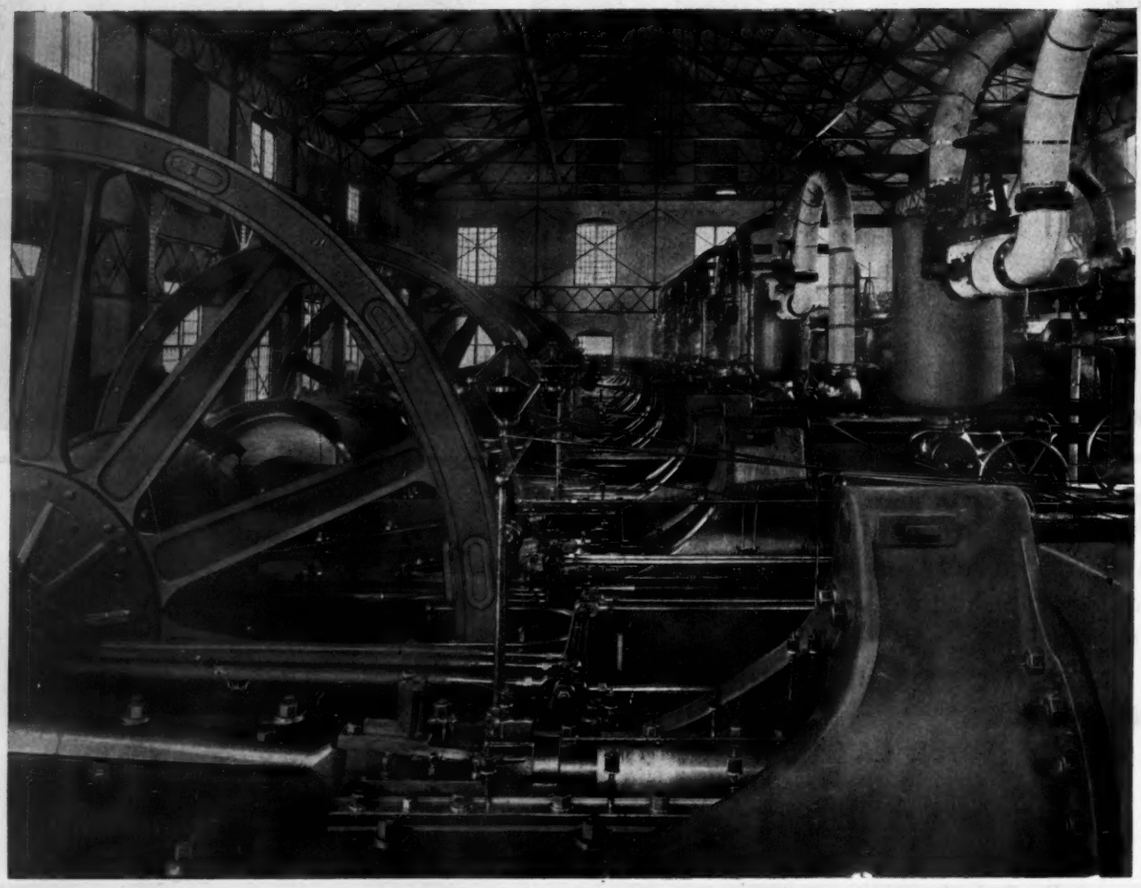

Group of Six Cross-Compound Condensing Blowing Engines. Installed at The South Sharon Works of The Carnegie Steel Co.

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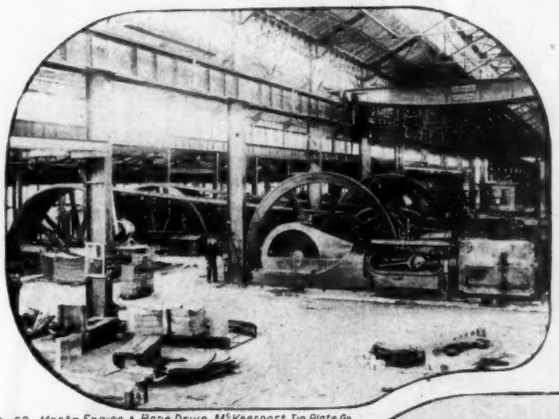
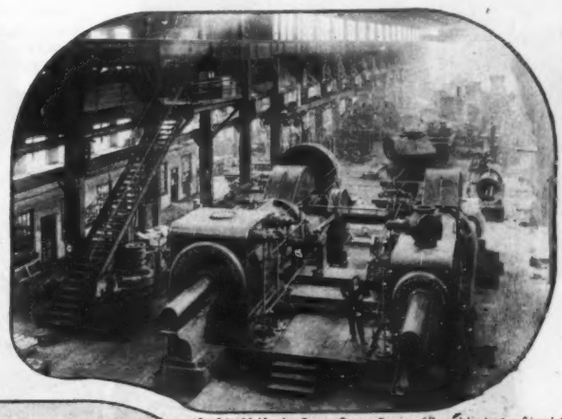
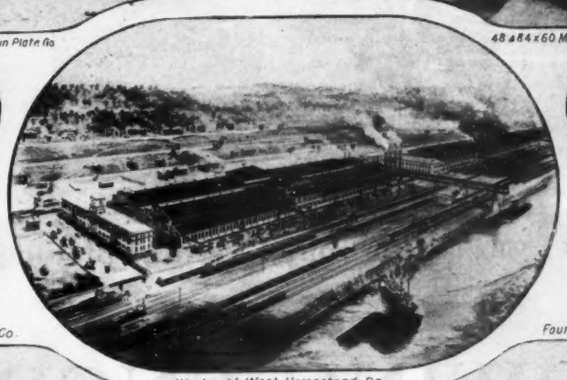


30 x 60 Mesta Engine & Rope Drive, McKeesport Tin Plate Co.

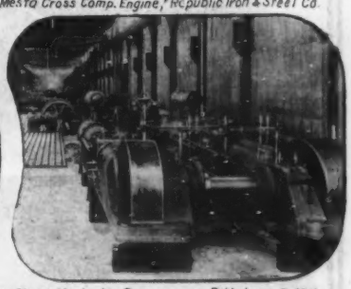


48 & 84 x 60 Mesta Cross Comp. Engine, Republic Iron & Steel Co.

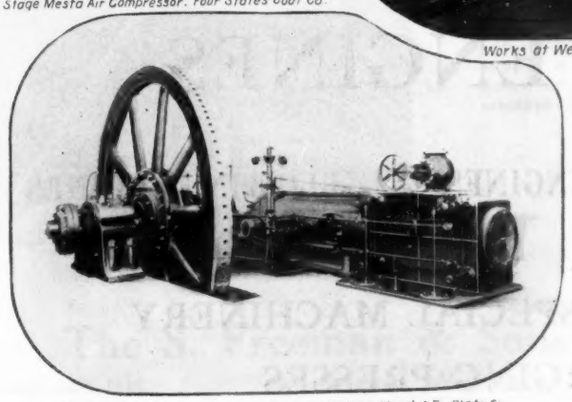
Stage Mesta Air Compressor, Four States Coal Co.



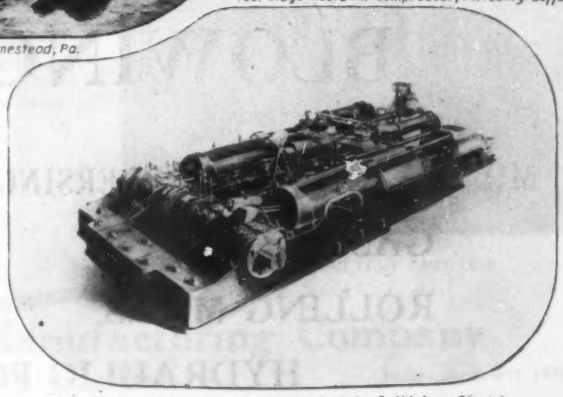
Works at West Homestead, Pa.



Four Stage Mesta Air Compressor, Pittsburg-Buffalo.



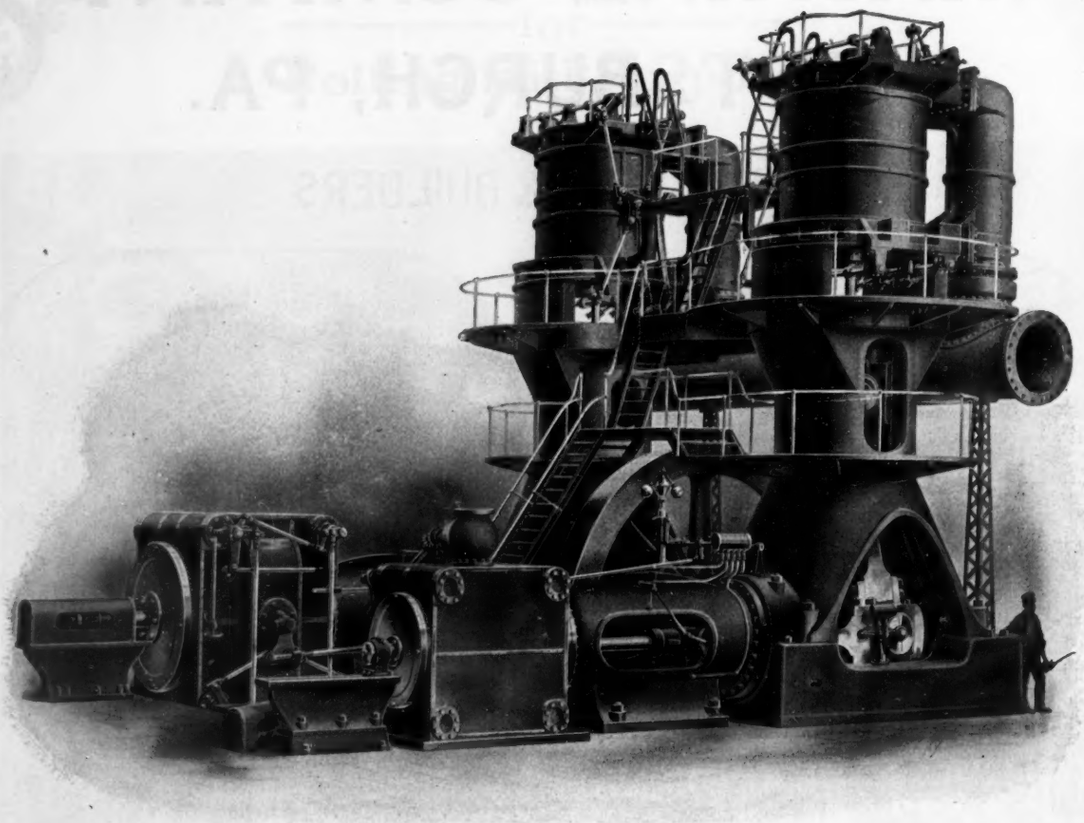
36 x 72 Mesta Engine, Built in 30 Days for Phillips Sheet & Tin Plate Co.



Twin Tandem Direct Reversing Engine built for Bethlehem Steel Co.

The William Tod Company

YOUNGSTOWN, OHIO



52" x 90" x 90 x 60" Horizontal-Vertical Blowing Engine

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GAS ENGINES PUMPING ENGINES

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Freeman Water Tube BOILERS

Always Produce Results

BOILER UNDER ERECTION

These illustrations show a Twelve-Hundred Horse-power Boiler Installation for Chicago Great Western Railroad at Oelwein, Iowa. Equipped with chain grate, stokers and superheaters.

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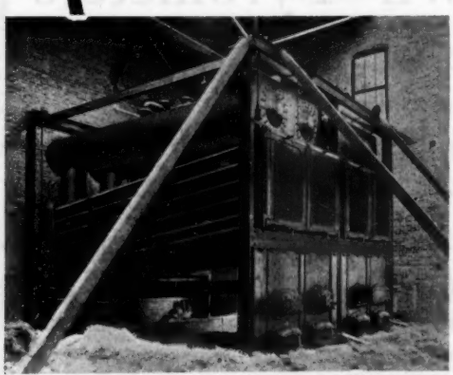

BOILER UNDER ERECTION

These illustrations show a Six Hundred Horse-power Boiler Installation at plant of Kelley-Racine Rubber Co., Racine, Wis., arranged for hand-firing.

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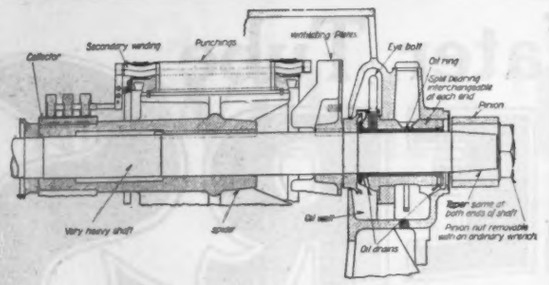

Rotor and Bearing Housing Diagram of Westinghouse Alternating Current Mill Motor

Why Mill Engineers Specify Westinghouse Alternating Current Mill Motors

THE diagram shows why Westinghouse alternating-current mill motors receive the endorsement of so many prominent mill engineers.

The large *shaft* is made of axle steel, the best material to withstand terrific stresses, and is strengthened by the spider. The spider also facilitates removal of the shaft when necessary.

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But these are only a few of the features that make Westinghouse A. C. Mill Motors reliable in operation and low in maintenance cost.

There are many more, all the result of the long practical experience of the Westinghouse Electric & Mfg. Co., in mill motor construction.

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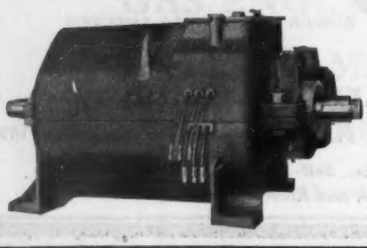
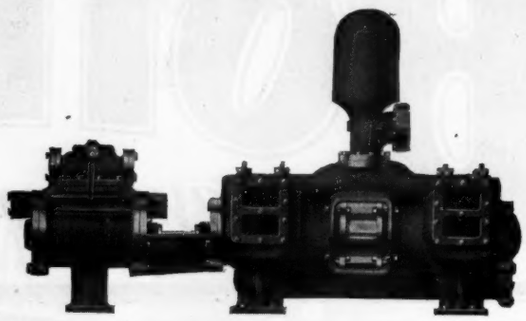


Westinghouse Alternating Current Mill Motor

The Prescott Mine Pump

(Intermountain Fattern)

Designed For Shaft and Station Service



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P 122.2

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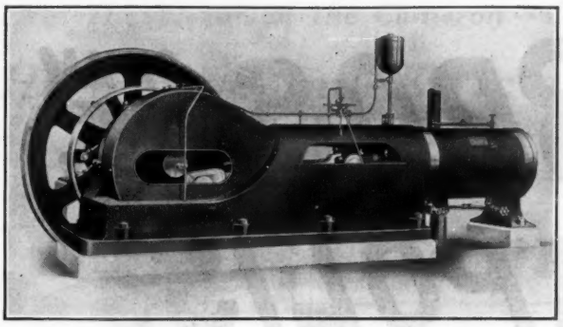

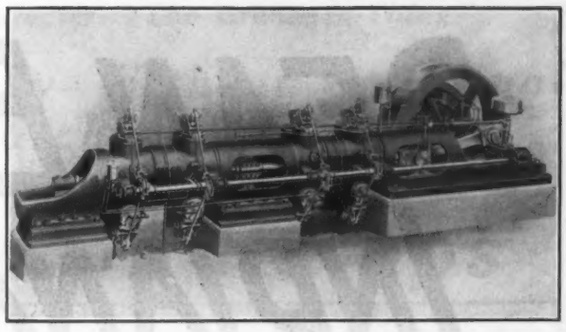

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They are noted for reliability and efficiency—pleasing both management and operating engineer. Write for catalogue.

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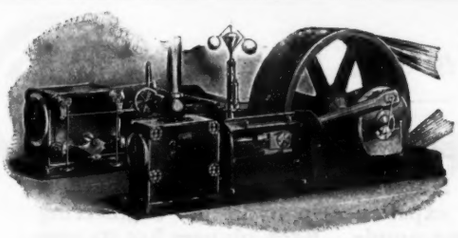

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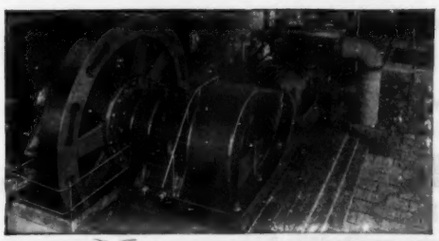

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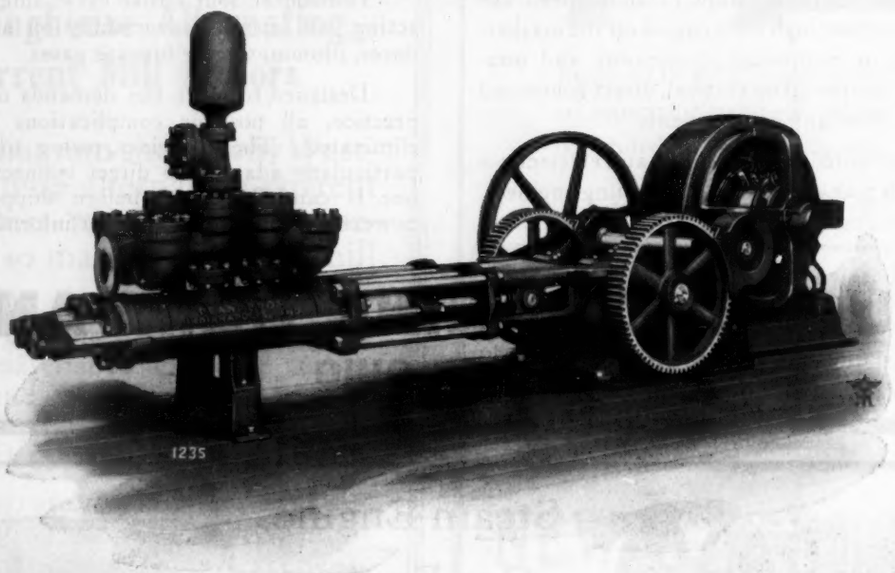

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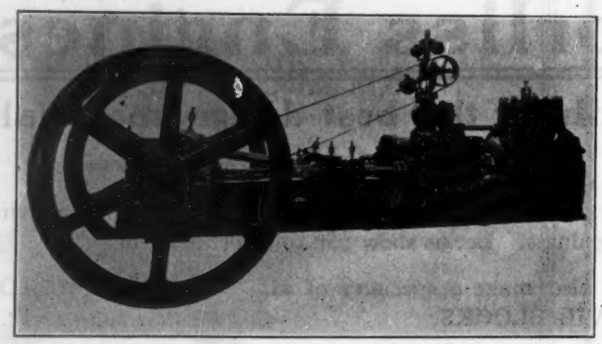

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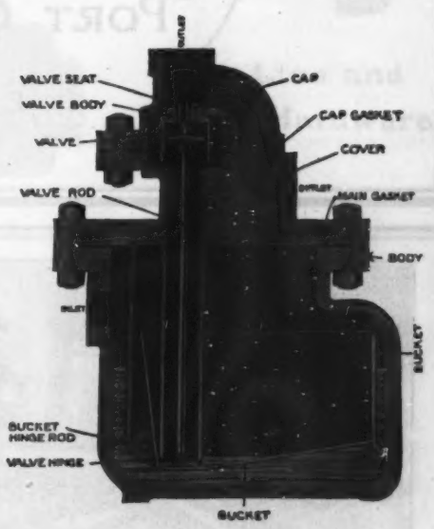

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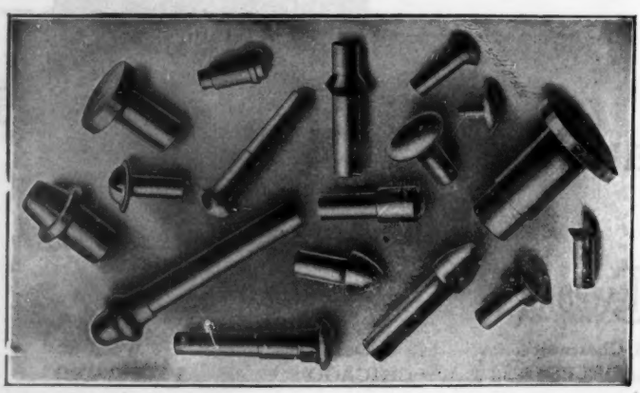

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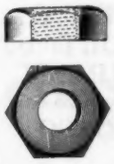

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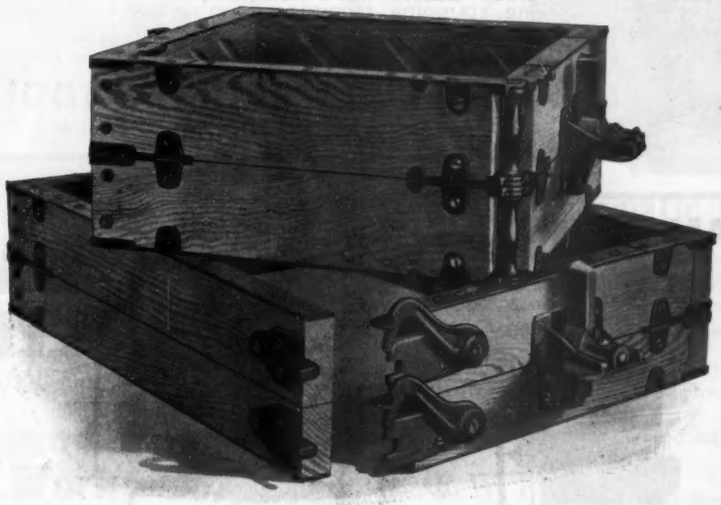

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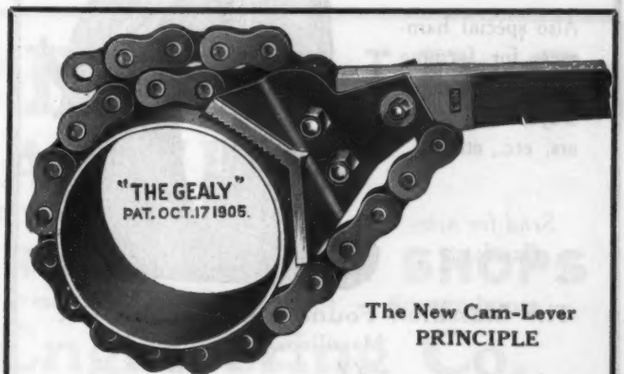

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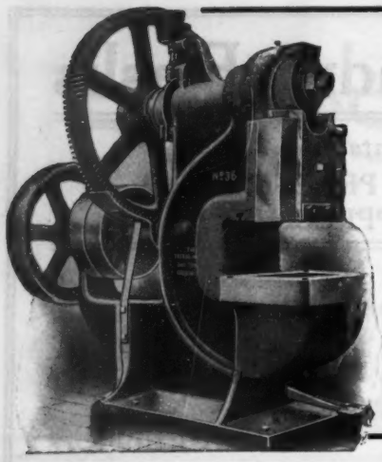

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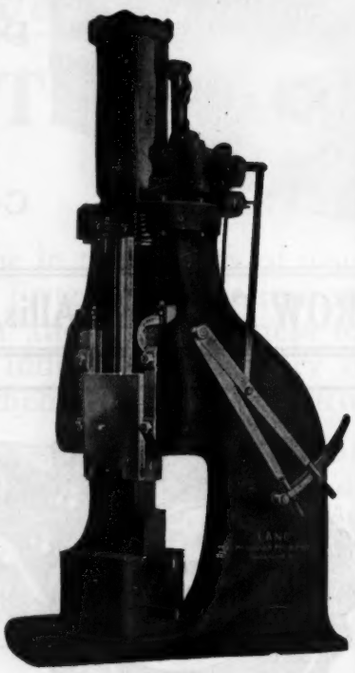

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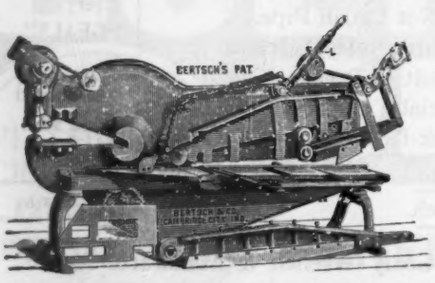

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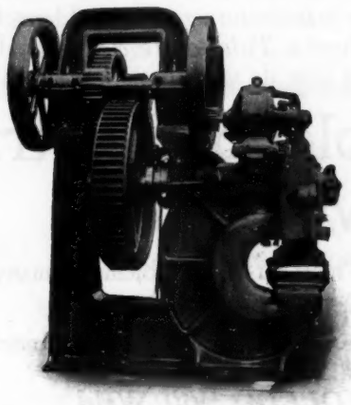

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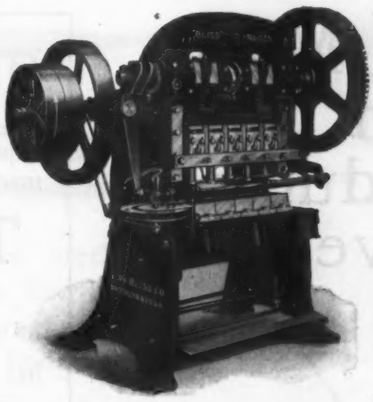

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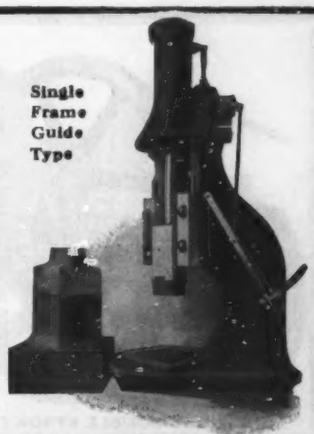

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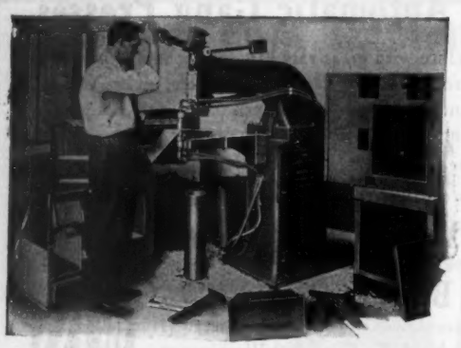

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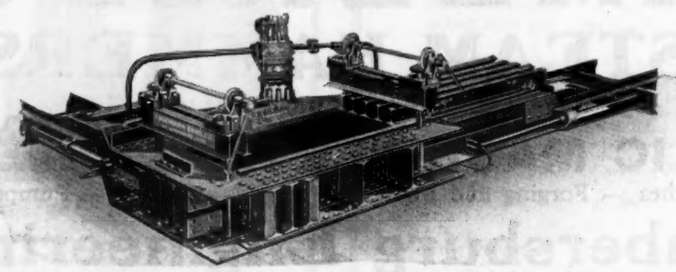

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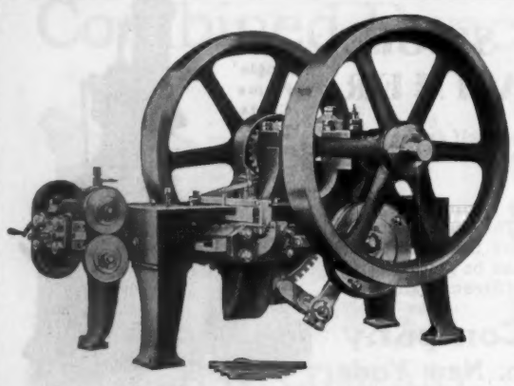

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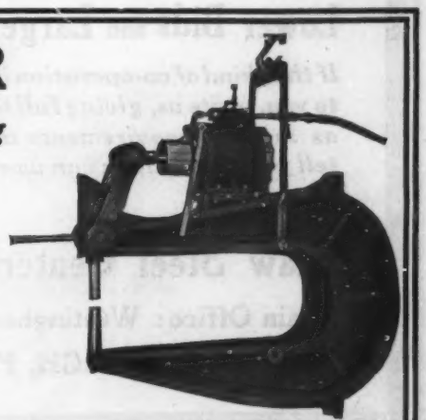

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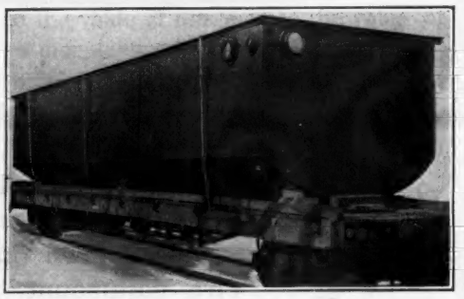

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Established 1840 PHILADELPHIA, PA.

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Listen:---

You can run the Ridgway Steam-Hydraulic Elevator before the works start up in the morning.

You can run it at the noon hour.

You can run it after quitting time.

Yes, you can come in the middle of the night and take stuff up and down stairs without turning a wheel.

This is only a little side feature of this wonderful Ridgway Elevator.

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And you don't pay one cent until it makes good.

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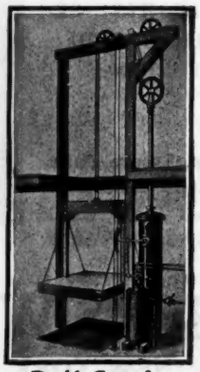
Nearly 1000 in Daily Use



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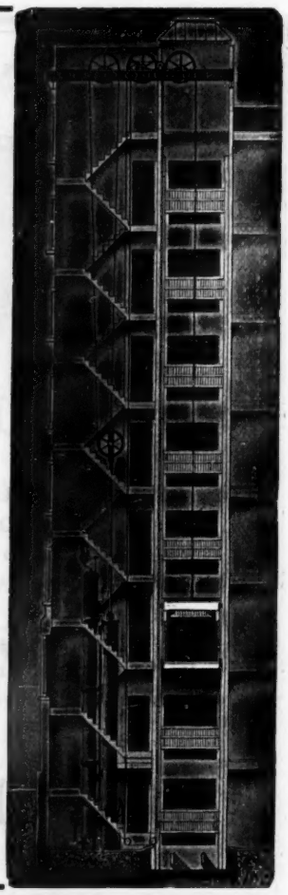
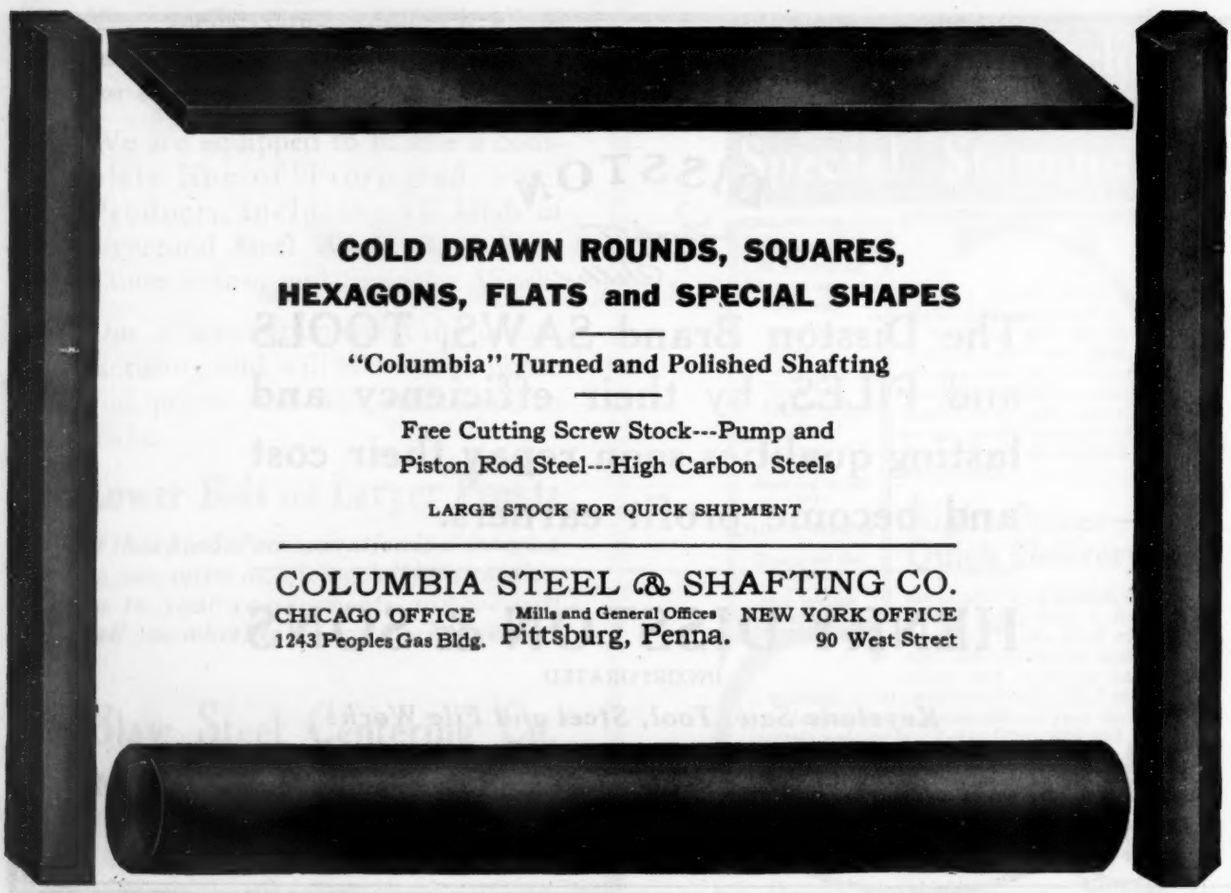


CRAIG RIDGWAY & SON

Coatesville, Pa.

ELEVATOR MAKERS TO FOLKS WHO KNOW



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Works, Steubenville, O. Works, Wheeling, W. Va.

THE IRON TRADE REVIEW

Volume L CLEVELAND, MAY 16, 1912 Number 20

Premiums Offerd for Prompt Delivery of Plates

Prices on Finished Materials Easily Maintained and Further Advances Expected—Strong Demand for Coke

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We offer you *Real Service* in Immediate Shipment out of stock of all sizes of plates in any length up to 45 feet. We anticipated these conditions, and have just what you need.

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Constructors of Horizontal Cross Regenerative By-Product Coke and Gas Ovens

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- LIGHT AND HEAVY -
All kinds of Alloy Steel carried in stock
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SPECIAL DROP FORGINGS OF ALL KINDS TO ORDER
SEND US PRINTS OR MODELS FOR PRICES
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FORGINGS
Quality Guaranteed. Prompt Shipment
No order too large—None too small for our careful attention.
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Heavy and Light FORGINGS of every description. *Drop Hammer Work.* We make a specialty of Automobile, Railway and Machinery Work.
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Mail Us Specifications for Quotations
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CLEVELAND, OHIO
WOOD AND METAL PATTERNS
OF EVERY DESCRIPTION
Nothing Too Big or Too Small for Us
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By HENRY MARION HOWE
Professor of Metallurgy, Columbia University
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NO delays in service from fires which are apt to occur at any time, thereby holding up deliveries of your product.
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Axles for Passenger or Freight Cars and Locomotives
"Pollak" Special Heat Treated Steel.
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MARINE MACHINE and ENGINE **Forgings**
from 10 lbs. to 100,000 lbs. each of every shape and description.
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HAVE YOUR FORGINGS MADE IN ROCKFORD
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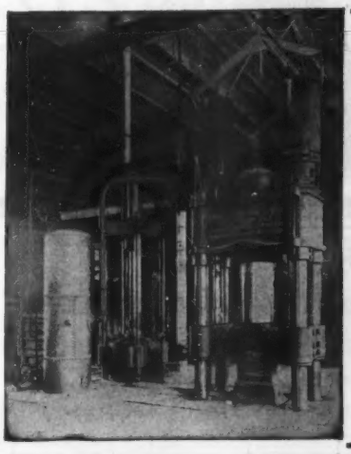

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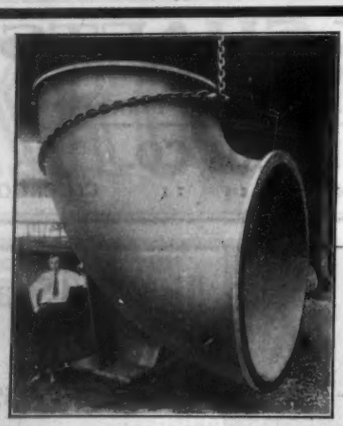
SLAG POTS
THE MARSHALL FOUNDRY CO., Pittsburg, Pa.



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GREY IRON, SEMI-STEEL, AIR FURNACE,
ANY SIZE UP TO 200 TONS IN WEIGHT

This casting was made by us in loam, with sweeps. The metal used in the casting was semi-steel. Next week we will illustrate method of machining this casting.

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Automobile Castings **Gears and Gear Blanks**

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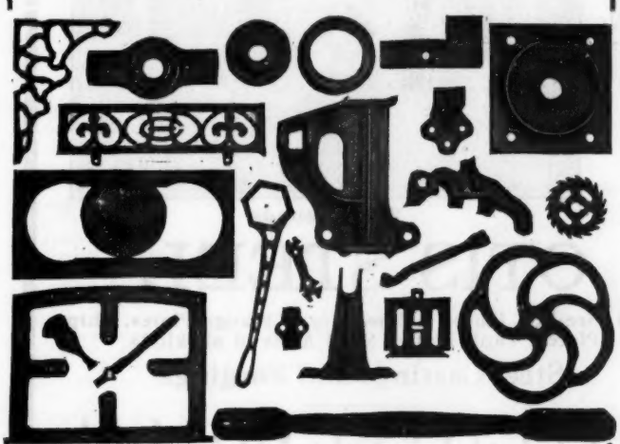
MALLEABLE IRON
CASTINGS
OF EVERY DESCRIPTION

Annual Capacity 25,000 Tons



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Prices furnished on receipt
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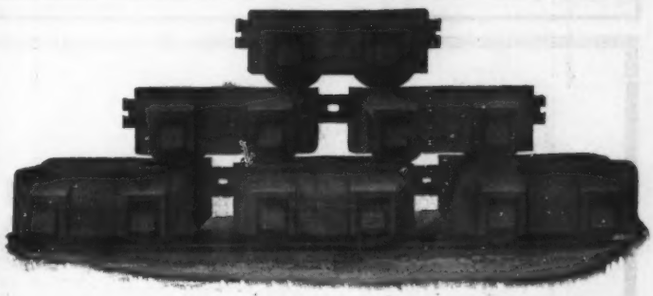

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We make lots of Alloy Steel Castings

IN

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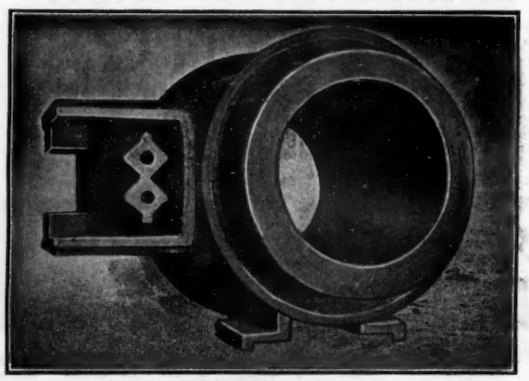
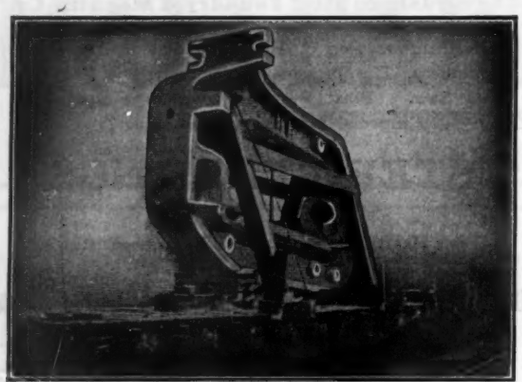
There is nothing too large for us to make

STEEL CASTINGS

from 100 to 100,000 pounds



29,000 Pounds



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Otis Fire-Box Plates a Specialty. Flange Plates, Ship Plates, Tank Plates, Steel Axles of all kinds

Steel Castings and Forgings

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Capacity 100 Tons Daily
Castings up to 50,000 Lbs.

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Good, Sound, Tough Castings Our Specialty

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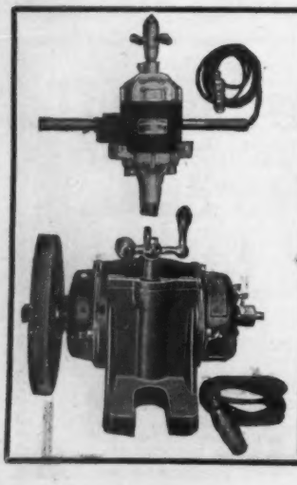

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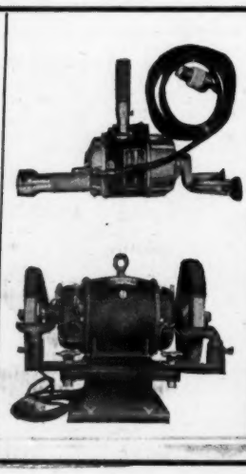

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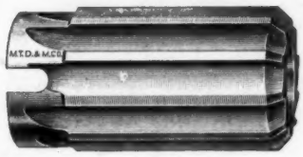

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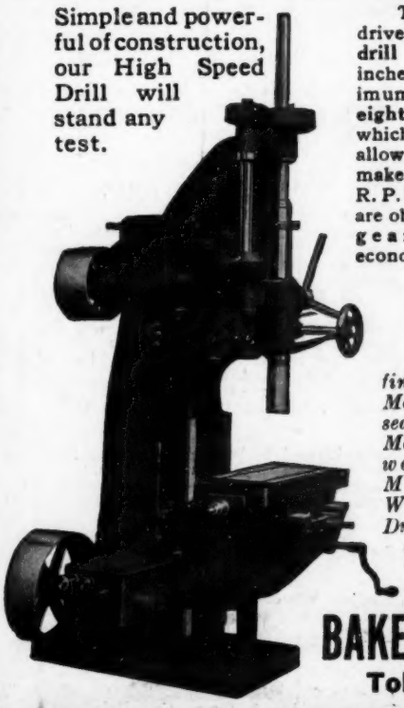

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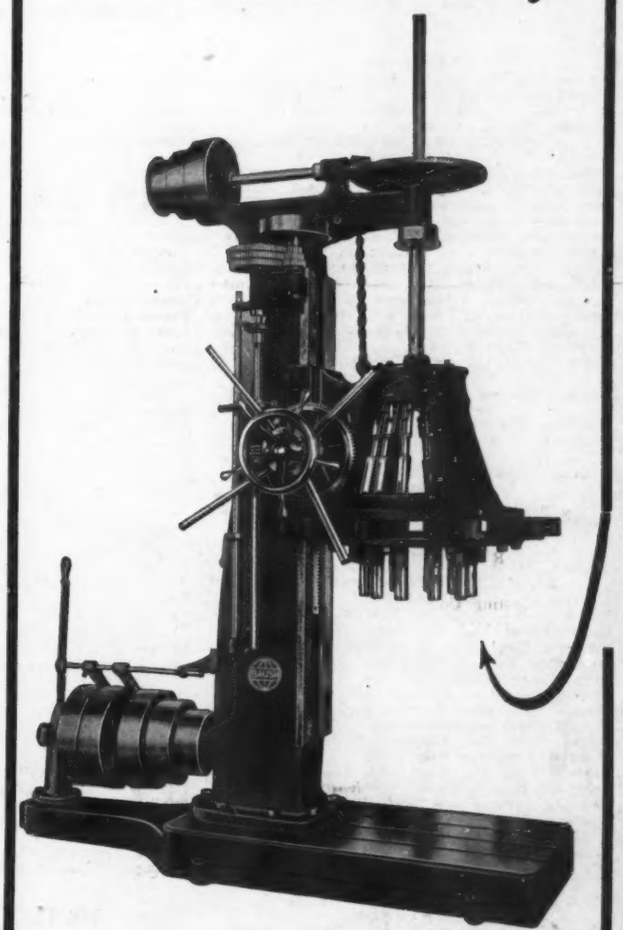

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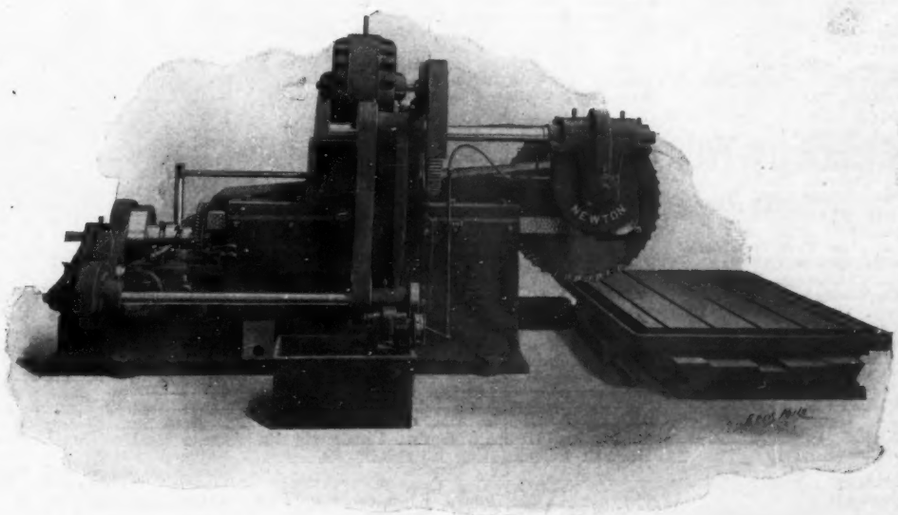

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Jeffrey Mfg. Co., Columbus, O.
Wellman-Seaver-Morgan Co., Cleveland, O.

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Blaw Steel Centering Co., Pittsburgh, Pa.

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Massillon Fdy. & Machine Co., Massillon, O.
National Malleable Castings Co., Cleveland, O.

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Jeffrey Mfg. Co., Columbus, O.

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(Industrial.)
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Maxwell Engrg. Co., Rome, N. Y.
Mesta Machine Co., Pittsburgh, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

CASTINGS.
(Converter.)
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CASTINGS.
(Crucible Steel.)
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Prime Steel Co., Milwaukee, Wis.
Sivyer Steel Casting Co., Milwaukee, Wis.
Swedish Crucible Steel Co., Detroit, Mich.
West Steel Casting Co., Cleveland, O.

CASTINGS.
(Die.)
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CASTINGS.
(Gear.)
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Sivyer Steel Casting Co., Milwaukee, Wis.
Strong Steel Fdy. Co., Buffalo, N. Y.

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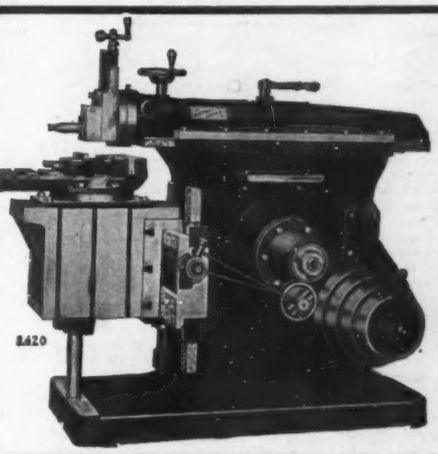

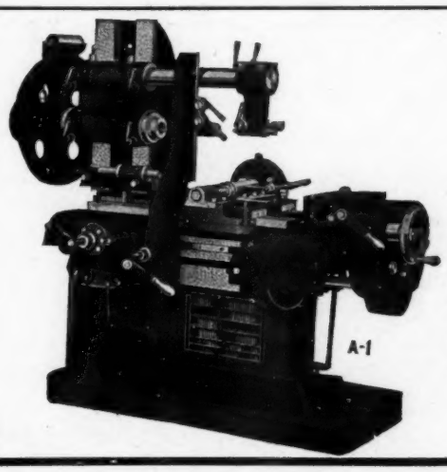

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DRILLS.
(Portable.)
Hisey-Wolf Machine Co., Cincinnati, O.
Newton Mch. Tool Wks., Inc., Philadelphia.
U. S. Electrical Tool Co., Cincinnati, O.

DRILLS.
(Rock.)
Ingersoll-Rand Co., New York.

DRILLS.
(Twist.)
Cleveland Twist Drill Co., Cleveland, O.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Ryerson, Jos. T., & Son, Chicago, Ill.

WHERE TO BUY

DRIVERS.
(Pile.)
Industrial Works, Bay City, Mich.

DYNAMOS.
Crocker-Wheeler Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., Pittsburgh.

ELECTRICAL EQUIPMENT.
(Second Hand.)
McCoy & Brandt, Pittsburgh, Pa.

ELECTRICAL INSTRUMENTS.
(Repaired and Tested.)
Stupakoff Laboratories, Pittsburgh, Pa.

ELEVATORS.
Ridgway, Craig, & Son, Coatesville, Pa.

ENAMELING.
(Porcelain.)
Geuder, Paeschke & Frey Co., Milwaukee.

ENGINEERS AND CONTRACTORS.
American Bridge Co. of New York, New York.
Bellefontaine Bridge & Steel Co.,
Bellefontaine, O.
Blair Engrg. Co., Chicago, Ill.
Blaw Steel Centering Co., Pittsburgh, Pa.
Bucyrus Steel Casting Co., Bucyrus, O.
Eichleay, John, Jr., Co., Pittsburgh, Pa.
Hibben & Co., So. Chicago, Ill.
Kennedy, Julian, Pittsburgh, Pa.
Koppers Co., H., Chicago, Ill.
Lackawanna Bridge Co., Buffalo, N. Y.
Ladd & Baker, Philadelphia, Pa.
Lake Erie Engrg. Works, Buffalo, N. Y.
Laughlin, Alex., & Co., Pittsburgh, Pa.
McClintic-Marshall Const. Co., Pittsburgh, Pa.
McClure, Geo. W., Son & Co., Pittsburgh, Pa.
McKee, Arthur G., Cleveland, O.
Morgan Engineering Co., Alliance, O.
Osborn Engineering Co., Cleveland, O.
Rockwell Furnace Co., New York City.
Shaw-Kendall Engrg. Co., Toledo, O.
Smythe, The S. R., Co., Pittsburgh, Pa.
Swindell, Wm., & Bros., Pittsburgh, Pa.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.
Union Fdy. & Mach. Co., Pittsburgh, Pa.
United Engineering & Fdy. Co., Pittsburgh.
Wellman & Son, S. T., Cleveland, O.
Wellman-Seaver-Morgan Co., Cleveland, O.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.
Worden-Allen Co., Chicago, Ill.

ENGINEERS AND CONTRACTORS.
(By-Product Coke Ovens.)
Koppers Co., H., Chicago, Ill.
United Coke & Gas Co., New York City.

ENGINE STOPS.
Locke Regulator Co., Salem, Mass.
Strong, Carlisle & Hammond Co., Cleveland.

ENGINES.
(Blowing.)
Hooven, Owens, Rentschler Co., Hamilton, O.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Tod Co., Wm., Youngstown, O.

ENGINES.
(Gas and Gasoline.)
Buckeye Engine Co., Salem, O.
Cooper, C. & G., Co., Mt. Vernon, O.
Mesta Machine Co., Pittsburgh, Pa.
Otto Gas Engine Wks., Philadelphia, Pa.
Struthers-Wells Co., Warren, Pa.
Tod Co., Wm., Youngstown, O.

ENGINES.
(Hoisting.)
Cooper, C. & G., Co., Mt. Vernon, O.
Vulcan Iron Works, Wilkesbarre, Pa.

ENGINES.
(Pneumatic.)
Detroit Hoist & Machine Co., Detroit, Mich.

ENGINES.
(Pumping.)
Hooven, Owens, Rentschler Co., Hamilton, O.
Tod Co., Wm., Youngstown, O.

ENGINES.
(Steam.)
Buckeye Engine Co., Salem, O.
Cooper, C. & G., Co., Mt. Vernon, O.
Hooven, Owens, Rentschler Co., Hamilton, O.
Lake Erie Engrg. Works, Buffalo, N. Y.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Southwark Fdy. & Mch. Co., Philadelphia, Pa.
Struthers-Wells Co., Warren, Pa.
Tod Co., Wm., Youngstown, O.

EQUIPMENT.
(By-Product Coke Oven.)
Koppers Co., H., Chicago, Ill.

EQUIPMENT.
(Rolling Mill.)
Bertsch & Co., Cambridge City, Ind.
Bucyrus Steel Casting Co., Bucyrus, O.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
Tod Co., Wm., Youngstown, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

EQUIPMENT.
(Welded Chain, Wire and Wire Nail Mills—Complete.)
Turner, Vaughn & Taylor Co.,
Cuyahoga Falls, O.

EXTRACTORS.
(Steam or Oil.)
Strong, Carlisle & Hammond Co., Cleveland.

FACINGS.
(Foundry.)
Dixon, Jos., Crucible Co., Jersey City, N. J.
Obermayer, S., Co., Cincinnati, O.

FACTORY SITES.
Greater Indianapolis Indust'l Ass'n Indianapolis.

FENCE.
(Woven Wire.)
American Steel & Wire Co., Chicago, Ill.
Cambria Steel Co., Johnstown, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

FERRO-MANGANESE.
Addy, Matthew & Co., Cincinnati, O.
Blackwell, Geo. G., & Sons, Ltd.,
Liverpool, Eng.
Mohr, J. J., & Son, Philadelphia, Pa.
Pickands, Brown & Co., Chicago, Ill.
Rogers, Brown & Co., Cincinnati, O.
Samuel, Frank, Philadelphia, Pa.

FERRO-SILICON.
Addy, Matthew & Co., Cincinnati, O.
Blackwell, Geo. G., & Sons, Ltd.,
Liverpool, Eng.
Mohr, J. J., & Son, Philadelphia, Pa.
Pickands, Brown & Co., Chicago, Ill.
Rogers, Brown & Co., Cincinnati, O.
Samuel, Frank, Philadelphia, Pa.
Tennessee Coal, Iron & R. R. Co.,
Birmingham, Ala.

FERRO.
(Vanadium.)
American Vanadium Co., Pittsburgh, Pa.

FILES.
Barnett, G. & H., Co., Philadelphia, Pa.
Disston & Sons, Inc., Henry, Philadelphia, Pa.
Nicholson File Co., Providence, R. I.

FILTERS.
(Oil.)
Eichleay, Jr., Co., John, Pittsburgh, Pa.

FIRE EXTINGUISHING APPARATUS.
General Fire Extinguisher Co.,
Providence, R. I.

FITTINGS.
(Pipe.)
Illinois Malleable Iron Co., Chicago, Ill.
National Tube Co., Pittsburgh, Pa.
Pittsburgh Piping & Equip. Co., Pittsburgh.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

FLANGES.
Dart, E. M., Mfg. Co., Providence, R. I.
Hubbard Steel Foundry Co., E. Chicago, Ind.
National Tube Co., Pittsburgh, Pa.
Sundberg Co., J. A., Chicago, Ill.

FLASKS.
Sterling Wheelbarrow Co., West Allis, Wis.

FLOORING.
(Bridge.)
Youngstown Iron & Steel Co., Youngstown, O.

FLUOR-SPAR.
Addy, Matthew & Co., Cincinnati, O.
Rogers, Brown & Co., Cincinnati, O.

FLY WHEELS.
Jones & Laughlin Steel Co., Pittsburgh, Pa.

FORGINGS.
American Iron & Steel Mfg. Co., Lebanon, Pa.
American Vanadium Co., Pittsburgh, Pa.
Anderson Forge & Mach. Co., Detroit, Mich.
Bethlehem Steel Co., So. Bethlehem, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Champion Machine & Forging Co., Cleveland.
Columbus Forge & Iron Co., Columbus, O.
Crucible Steel Forge Co., Cleveland, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Horsburgh Forging Co., Cleveland, O.
Ingalls-Shepard Forging Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Kropp Forge Co., Chicago, Ill.
Martin Forging Co., H. J., Indianapolis, Ind.
Mesta Machine Co., Pittsburgh, Pa.
Otis Steel Co., Cleveland, O.
Pollak Steel Co., Cincinnati, O.
Rockford Drop Forge Co., Rockford, Ill.
Smith, A. O., Co., Milwaukee, Wis.
Steel Car Forge Co., Pittsburgh, Pa.
Sundberg Co., J. A., Chicago, Ill.

FORGINGS.
(Auto.)
Anderson Forge & Mach. Co., Detroit, Mich.
General Drop Forge Co., Buffalo, N. Y.
Kropp Forge Co., Chicago, Ill.
Martin Forging Co., H. J., Indianapolis, Ind.

FORGINGS.
(Car and Locomotive.)
American Iron & Steel Mfg. Co., Lebanon, Pa.
Andrews Steel Co., Newport, Ky.
Cambria Steel Co., Johnstown, Pa.
Cleveland City Forge & Iron Co., Cleveland.
Oliver Iron & Steel Co., Pittsburgh, Pa.
Steel Car Forge Co., Pittsburgh, Pa.

FORGINGS.
(Copper and Alloy Steel.)
Anderson Forge & Mach. Co., Detroit, Mich.
Kropp Forge Co., Chicago, Ill.
Martin Forging Co., H. J., Indianapolis, Ind.

FORGINGS.
(Drop.)
Anderson Forge & Mach. Co., Detroit, Mich.
Champion Machine & Forging Co., Cleveland.
Columbus Forge & Iron Co., Columbus, O.
General Drop Forge Co., Buffalo, N. Y.
Ingalls-Shepard Forging Co., Chicago, Ill.
Martin Forging Co., H. J., Indianapolis, Ind.
Oliver Iron & Steel Co., Pittsburgh, Pa.
Rockford Drop Forge Co., Rockford, Ill.
Smith, A. O., Co., Milwaukee, Wis.
Steel Car Forge Co., Pittsburgh, Pa.
Western Drop Forge Co., Marion, Ind.

FOUNDRY EQUIPMENT AND SUPPLIES.
(Iron and Brass.)
Arcade Mfg. Co., Freeport, Ill.
Detroit Foundry Supply Co., Detroit, Mich.
Kelly, T. P. & Co., New York, N. Y.
Northern Engineering Works, Detroit, Mich.
Obermayer Co., S., Cincinnati, O.
Paxson, J. W., Co., Philadelphia, Pa.
Sly Mfg. Co., W. W., Cleveland, O.
Sterling Wheelbarrow Co., West Allis, Wis.
Whiting Foundry Equipment Co., Harvey, Ill.

FURNACES.
(Annealing.)
General Electric Co., Schenectady, N. Y.
Hagan, George J., Pittsburgh, Pa.
Rockwell, W. S., Co., New York.
Swindell & Bros., Wm., Pittsburgh, Pa.

FURNACES.
(Blast.)
Knox Pressed & Welded Steel Co., Pittsburgh.
Ladd & Baker, Philadelphia, Pa.
Lake Erie Engrg. Wks., Buffalo, N. Y.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
McClure, Son & Co., G. W., Pittsburgh, Pa.
McKee, Arthur G., Cleveland, O.
Meehan Boiler & Const. Co., Lowellville, O.
Mesta Machine Co., Pittsburgh, Pa.
Riter-Conley Mfg. Co., Pittsburgh, Pa.
Smythe Co., S. R., Pittsburgh, Pa.
Southwark Fdy. & Mch. Co., Philadelphia, Pa.
Strong, Carlisle & Hammond Co., Cleveland.
Wellman-Seaver-Morgan Co., Cleveland, O.

FURNACES.
(Brass and Copper Melting.)
Strong, Carlisle & Hammond Co., Cleveland.

FURNACES.
(Crucible.)
Laughlin & Co., Alex., Pittsburgh, Pa.
Paxson, J. W., Co., Philadelphia, Pa.
Strong, Carlisle & Hammond Co., Cleveland.

FURNACES.
(Electrically Heated.)
Bristol Co., Waterbury, Conn.
Strong, Carlisle & Hammond Co., Cleveland.

FURNACES.
(Forging.)
Strong, Carlisle & Hammond Co., Cleveland.

FURNACES.
(Lead, Pot and Muffle Annealing, Wire Mills.)
Turner, Vaughn & Taylor Co.,
Cuyahoga Falls, O

FURNACES.
(Melting.)
Hawley Down Draft Furnace Co., Easton, Pa.
Rockwell Furnace Co., New York, N. Y.
Strong, Carlisle & Hammond Co., Cleveland.
Whiting Foundry Equip. Co., Harvey, Ill.

WHERE TO BUY

FURNACES.
(Oil, Gas or Coke, Welded Chain Factories.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

FURNACES.
(Reheating.)
Morgan Construction Co., Worcester, Mass.

FURRING.
(Metal.)
Youngstown Iron & Steel Co., Youngstown.

GALVANIZING.
(Custom.)
Brier Hill Steel Co., Youngstown, O.
Geuder, Paeschke & Frey Co., Milwaukee, Wis.

GASKETS.
Erbestos Brake Lining Co., Philadelphia, Pa.

GAUGES.
(Recording and Steam.)
American Steam Gauge & Valve Mfg. Co., Boston, Mass.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia, Pa.

GEAR CUTTING.
Newton Machine Tool Wks., Philadelphia, Pa.

GEARS.
Bilgram Machine Works, Philadelphia, Pa.
Boston Gear Works, Norfolk Downs, Mass.
Bucyrus Steel Casting Co., Bucyrus, O.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Farrel Foundry & Mach. Co., Ansonia, Conn.
Fawcus Machine Co., Pittsburgh, Pa.
Foote Bros. Gear & Mach. Co., Chicago, Ill.
Ganschow, Wm., Co., Chicago, Ill.
Gleason Wks., Rochester, N. Y.
Horsburgh & Scott Co., Cleveland, O.
Hubbard Steel Foundry Co., E. Chicago, Ind.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
New Process Rawhide Co., Syracuse, N. Y.
Nuttall, R. D., Co., Pittsburgh, Pa.
Union Foundry & Machine Co., Pittsburgh.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Van Dorn & Dutton Co., Cleveland, O.

GEARS.
(Bevel.)
Boston Gear Works, Norfolk Downs, Mass.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Horsburgh & Scott Co., Cleveland, O.
Mesta Machine Co., Pittsburgh, Pa.
New Process Rawhide Co., Syracuse, N. Y.
Nuttall, R. D., Co., Pittsburgh, Pa.

GEARS.
(Cast Steel, Machine Molded.)
Chicago Rawhide Mfg. Co., Chicago, Ill.
Horsburgh & Scott Co., Cleveland, O.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Nuttall, R. D., Co., Pittsburgh, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

GEARS.
(Cut.)
Boston Gear Works, Norfolk Downs, Mass.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Fawcus Machine Co., Pittsburgh, Pa.
Foote Bros. Gear & Mach. Co., Chicago, Ill.
Ganschow, Wm., Co., Chicago, Ill.
Horsburgh & Scott Co., Cleveland, O.
Mesta Machine Co., Pittsburgh, Pa.
New Process Rawhide Co., Syracuse, N. Y.
Nuttall, R. D., Co., Pittsburgh, Pa.
Van Dorn & Dutton Co., Cleveland, O.

GEARS.
(Rawhide.)
Chicago Rawhide Mfg. Co., Chicago, Ill.
Foote Bros. Gear & Mach. Co., Chicago, Ill.
Ganschow, Wm., Co., Chicago, Ill.
Horsburgh & Scott Co., Cleveland, O.
New Process Rawhide Co., Syracuse, N. Y.
Nuttall, R. D., Co., Pittsburgh, Pa.

GEARS.
(Vanadium.)
American Vanadium Co., Pittsburgh, Pa.

GENERATORS.
(Direct and Alternating.)
Crocker-Wheeler Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., Pittsburgh.

GLASSES.
(Gage Boiler.)
Strong, Carlisle & Hammond Co., Cleveland.

GOVERNORS.
(Pump.)
Strong, Carlisle & Hammond Co., Cleveland.

GRAPHITE.
Dixon Crucible Co., Jos., Jersey City, N. J.
Ilsley, Doubleday & Co., New York City.

GRATES.
Green Engrg. Co., Chicago, Ill.

GRINDERS.
(Chain Die, Welded Chain Factories.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

GRINDERS.
(Electrical.)
Cincinnati Electrical Tool Co., Cincinnati, O.
Hisey-Wolf Machine Co., Cincinnati, O.

GRINDERS.
(Nail, Machine Knife, Wire Nail Mills.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

GRINDERS.
(Pneumatic.)
Cleveland Pneumatic Tool Co., Cleveland, O.

GRINDERS.
(Swing Frame.)
Pittsburgh Emery Wheel Co., Pittsburgh, Pa.

GUARDS.
(Machinery for Prevention of Accidents.)
Geuder, Paeschke & Frey Co., Milwaukee, Wis.

HAMMERS.
(Belt Driven.)
Bradley & Son, C. C., Syracuse, N. Y.

HAMMERS.
(Drop.)
Alliance Machine Co., Alliance, O.
Bliss, E. W., Co., Brooklyn, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Massillon Fdy. & Mach. Co., Massillon, O.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.
Toledo Machine & Tool Co., Toledo, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Waterbury Farrel Fdy. & Mach. Co., Waterbury, Conn.

HAMMERS.
(Foot and Power, Welded Chain Factories.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

HAMMERS.
(Pneumatic.)
Cleveland Pneumatic Tool Co., Cleveland, O.
Ryerson, Joseph T., & Son, Chicago, Ill.

HAMMERS.
(Power.)
Beaudry & Co., Inc., Boston, Mass.
Bradley & Son, C. C., Syracuse, N. Y.
Buffalo Fdy. & Mach. Co., Buffalo, N. Y.
Cleveland Punch & Shear Wks. Co., Cleveland.
Massillon Fdy. & Mach. Co., Massillon, O.
Morgan Engineering Co., Alliance, O.
Toledo Machine & Tool Co., Toledo, O.

HAMMERS.
(Steam.)
Buffalo Fdy. & Mach. Co., Buffalo, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Massillon Fdy. & Mach. Co., Massillon, O.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.

HAMMERS.
(Steam Gravity Drop.)
Massillon Fdy. & Mach. Co., Massillon, O.

HANGERS.
Jones & Laughlin Steel Co., Pittsburgh, Pa.

HEADS.
(Dished.)
Worth Bros. Co., Coatesville, Pa.

HEATERS.
(Feed Water.)
Shaw-Kendall Engrg. Co., Toledo, O.

HOISTS.
(Chain.)
Chisholm & Moore Mfg. Co., Cleveland, O.

HOISTS.
(Compressed Air Geared.)
Detroit Hoist & Machine Co., Detroit, Mich.
Ingersoll-Rand Co., New York.

HOISTS.
(Electric.)
Alliance Machine Co., Alliance, O.
Browning, Victor R., & Co., Cleveland, O.
Euclid Crane & Hoist Co., Euclid, O.
General Electric Co., Schenectady, N. Y.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.
Northern Engineering Works, Detroit, Mich.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Toledo Bridge & Crane Co., Toledo, O.
Whiting Foundry Equipment Co., Harvey, Ill.

HOISTS.
(Pneumatic.)
Detroit Hoist & Machine Co., Detroit, Mich.
Northern Engineering Works, Detroit, Mich.
Ridgway, Craig, & Son, Coatesville, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

HOOPS AND BANDS.
American Steel & Wire Co., Chicago, Ill.
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Illinois Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.

HOSE.
(Pneumatic.)
Cleveland Pneumatic Tool Co., Cleveland, O.

INJECTORS.
Watson, N. A., Erie, Pa.

INSTRUMENTS.
(Electrical.)
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia, Pa.

IRON.
(Basic—Bessemer—Malleable.)
Addy, Matthew, & Co., Cincinnati, O.
Inland Steel Co., Chicago, Ill.
Pickands, Brown & Co., Chicago, Ill.

IRON.
(Cutting Apparatus.)
Newton Mach. Tool Wks., Inc., Philadelphia

IRON.
(Pig.)
Addy, Matthew, & Co., Cincinnati, O.
Baird & West, Detroit, Mich.
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Columbus Iron & Steel Co., Columbus, O.
Eaton, Rhodes & Co., Cincinnati, O.
Globe Iron Co., Jackson, O.
Hanna & Co., M. A., Cleveland, O.
Hillman & Son, J. H., Pittsburgh, Pa.
Illinois Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
McKeefrey & Co., Leetonia, O.
Mitchell-Diggins Iron Co., Cadillac, Mich.
Mohr, J. J., & Son, Philadelphia, Pa.
Perry Iron Co., Erie, Pa.
Pickands, Brown & Co., Chicago, Ill.
Pickands, Mather & Co., Cleveland, O.
Pioneer Coal & Coke Co., St. Louis, Mo.
Republic Iron & Steel Co., Youngstown, O.
Rogers, Brown & Co., Cincinnati, O.
Samuel, Frank, Philadelphia, Pa.
Snyder & Co., W. P., Pittsburgh, Pa.
Stewart Iron Co., Ltd., Cleveland, O.
Superior Charcoal Iron Co., Grand Rapids, Mich.
Tenn. Coal, Iron & R. R. Co., Birmingham, Ala.
Thomas Furnace Co., Milwaukee, Wis.
Upson Nut Co., Cleveland, O.
Wallingford & Co., Walter, Cincinnati, O.

WHERE TO BUY

IRON.
(Staybolt.)
Bourne-Fuller Co., Cleveland, O.

IRON AND STEEL.
(Galvanized.)
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburgh.
Bourne-Fuller Co., Cleveland, O.
Brier Hill Steel Co., Youngstown, O.
Inland Steel Co., Chicago, Ill.
McCalla, Harold, Philadelphia, Pa.
Newport Rolling Mill Co., Newport, Ky.
Ryerson, Jos. T., & Son, Chicago, Ill.
Wood & Co., Alan, Philadelphia, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

IRON AND STEEL.
(Scrap.)
American Bridge Co. of New York, N. Y.

IRON AND STEEL.
(Swedish.)
Bourne-Fuller Co., Cleveland, O.
Scully Steel & Iron Co., Chicago, Ill.

JAPANNING.
(All Colors.)
Geuder, Paeschke & Frey Co., Milwaukee.

JOINTS.
(Rail.)
Carnegie Steel Co., Pittsburgh, Pa.

JOINTS.
(Universal.)
Boston Gear Works, Norfolk Downs, Mass.

KETTLES AND POTS.
(Galvanizing.)
Wilfong Iron Works Co., M. F., Philadelphia.

KEYS AND COTTERS.
(Machine.)
Standard Gauge Steel Co., Beaver Falls, Pa.

KEYSEATERS.
Baker Bros., Toledo, O.
Mitts & Merrill, Saginaw, Mich.

LADLES.
Industrial Car Co., West Park, O.
Northern Engineering Wks., Detroit, Mich.
Riter-Conley Mfg. Co., Pittsburgh, Pa.
Whiting Fdy. & Equip. Co., Harvey, Ill.

LAMPS.
(Arc.)
Westinghouse Elec. & Mfg. Co., Pittsburgh.

LAMPS.
(Incandescent.)
Westinghouse Elec. & Mfg. Co., Pittsburgh.

LATH.
(Expanded Metal.)
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburgh.
Newport Rolling Mill Co., Newport, Ky.
Trussed Concrete Steel Co., Detroit, Mich.
Youngstown Iron & Steel Co., Youngstown, O.

LATHES.
Baird Machinery Co., Pittsburgh, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Jones & Lamson Mach. Co., Springfield, Vt.
Manning, Maxwell & Moore, Inc., New York.
McCabe, J. J., New York City.
Motch & Merryweather Machy. Co., Cleveland
Niles-Bement-Pond Co., New York City.

LATHES.
(Turret.)
Jones & Lamson Mach. Co., Springfield, Vt.
New Britain Mch. Co., New Britain, Ct.

LINE MATERIAL.
(Telegraph and Telephone.)
Inland Steel Co., Chicago, Ill.
National Tube Co., Pittsburgh, Pa.

LININGS.
(Brake.)
Erbestos Brake Lining Co., Philadelphia, Pa.

LININGS.
(Cupola.)
Big Savage Fire Brick Co., Frostburg, Md.
Louisville Fire Br'k Wks., Highland Park, Ky.

LININGS.
(Forge and Furnace.)
Ashland Fire Brick Co., Ashland, Ky.
Pyro Clay Products Co., Oak Hill, O.

LININGS.
(Ladle.)
Pyro Clay Products Co., Oak Hill, O.

LOCKERS.
(Wire-Sheet Metal.)
Bernstein Mfg. Co., Philadelphia, Pa.

LOCOMOTIVES.
(Electric.)
Atlas Car & Mfg. Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Pittsburgh

LOCOMOTIVES.
(Industrial.)
Vulcan Iron Works, Wilkesbarre, Pa.

LUMBER.
(Boxing, Crating, Flask and Pattern.)
Johnson Lumber Co., Milwaukee, Wis.

MACHINERY.
(Automatic Gear Cutting.)
Cincinnati Gear Cutting Mch. Co., Cincinnati.
Motch & Merryweather Machy. Co., Cleveland
Newton Mch. Tool Wks., Inc., Philadelphia.

MACHINERY.
(Barb Wire Fence, Barb Nail Wire, Wire Mills.)
Turner, Vaughn & Taylor Co.,
Cuyahoga Falls, O.

MACHINERY.
(Bending and Straightening.)
Bertsch & Co., Cambridge City, Ind.
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Cleveland Punch & Shear Wks. Co., Cleveland.
Covington Machine Co., Covington, Va.
Dries & Krump Mfg. Co., Chicago, Ill.
Espen-Lucas Machine Wks., Philadelphia, Pa.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
Toledo Machine & Tool Co., Toledo, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.
Youngstown Fdy. & Mchy. Co., Youngstown, O.

MACHINERY.
(Blue Printing.)
Buckeye Engine Co., Salem, O.

MACHINERY.
(Bolt and Nut.)
Baird Machinery Co., Pittsburgh, Pa.
Landis Machine Co., Waynesboro, Pa.
National Machy. Co., Tiffin, O.
Newton Mch. Tool Wks., Inc., Philadelphia.
Williams Tool Co., Erie, Pa.

MACHINERY.
(Boring and Turning.)
Baker Bros., Toledo, O.
Espen-Lucas Machine Wks., Philadelphia, Pa.
McCabe, J. J., New York City.
Mitts & Merrill, Saginaw, Mich.
Motch & Merryweather Machy. Co., Cleveland.
Newton Mch. Tool Wks., Inc., Philadelphia.
Niles-Bement-Pond Co., New York City.
Warner & Swasey Co., Cleveland, O.

MACHINERY.
(By-Product Coke Oven.)
Koppers Co., H., Chicago, Ill.

MACHINERY.
(Cement.)
Vulcan Iron Works, Wilkesbarre, Pa.

MACHINERY.
(Centrifugal.)
Koppers Co., H., Chicago, Ill.

MACHINERY.
(Coil and Trace Chain, Welded Chain Factories.)
Turner, Vaughn & Taylor Co.,
Cuyahoga Falls, O.

MACHINERY.
(Coke Ovens.)
Koppers Co., H., Chicago, Ill.

MACHINERY.
(Coping.)
Newton Mch. Tool Wks., Inc., Philadelphia.

MACHINERY.
(Crushing.)
Bartlett & Snow Co., C. O., Cleveland, O.

MACHINERY.
(Cutting Off—Cold Metal.)
Birdsboro Steel Fdy. & Mch. Co.,
Birdsboro, Pa.
Cleveland Punch & Shear Wks. Co., Cleveland.
Espen-Lucas Machine Wks., Philadelphia, Pa.
Newton Mch. Tool Wks., Inc., Philadelphia.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

MACHINERY.
(Drilling.)
Baker Bros., Toledo, O.
Baush Machine Tool Co., Springfield, Mass.
Hisey-Wolf Machine Co., Cincinnati, O.
Massillon Fdy. & Mch. Co., Massillon, O.
Motch & Merryweather Machy. Co., Cleveland.
Newton Mch. Tool Wks., Inc., Philadelphia.
Niles-Bement-Pond Co., New York City.

MACHINERY.
(Drilling and Boring, Horizontal.)
Newton Mch. Tool Wks., Inc., Philadelphia.
Pawling & Harnischfeger Co., Milwaukee.

MACHINERY.
(Drilling, Multiple.)
Baush Machine Tool Co., Springfield, Mass.
Newton Mch. Tool Wks., Inc., Philadelphia.

MACHINERY.
(Drilling, Radial.)
Baush Machine Tool Co., Springfield, Mass.
Hisey-Wolf Machine Co., Cincinnati, O.
Newton Mch. Tool Wks., Inc., Philadelphia.

MACHINERY.
(Electric Welding.)
Thomson Electric Welding Co., Lynn, Mass.
Toledo Electric Welder Co., Cincinnati, O.
Winfield Elec. Welding Mach. Co., Warren, O

MACHINERY.
(Elevating and Conveying.)
Bartlett & Snow Co., C. O., Cleveland, O.
Brown Hoisting Machy. Co., Cleveland, O.
Jeffrey Mfg. Co., Columbus, O.
McMyler Interstate Co., Cleveland, O.
Vulcan Iron Works, Wilkesbarre, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.

MACHINERY.
(Forging.)
Bethlehem Steel Co., So. Bethlehem, Pa.
Bliss Co., E. W., Brooklyn, N. Y.
Morgan Engineering Co., Alliance, O.
Tod Co., Wm., Youngstown, O.
Toledo Machine & Tool Co., Toledo, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

MACHINERY.
(Galvanizing.)
Erie Foundry Co., Erie, Pa.

MACHINERY.
(Gear Cutting.)
Cincinnati Gear Cutting Mch. Co., Cincinnati
Cincinnati Shaper Co., Cincinnati, O.
Gleason Works, Rochester, N. Y.
Newton Mch. Tool Wks., Inc., Philadelphia.

MACHINERY.
(Grinding.)
Blake & Johnson Co., Waterbury, Conn.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Motch & Merryweather Machy. Co., Cleveland
Newton Mch. Tool Wks., Inc., Philadelphia.
Norton Co., Worcester, Mass.
Pittsburgh Emery Wheel Co., Pittsburgh, Pa

MACHINERY.
(Hydraulic.)
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Logemann Bros. Co., Milwaukee, Wis.
Mesta Machine Co., Pittsburgh, Pa.
Tod Co., Wm., Youngstown, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

MACHINERY.
(Milling.)
Cincinnati Milling Mach. Co., Cincinnati, O.
Espen-Lucas Machine Wks., Philadelphia, Pa.
Foote Bros. Gear & Mach. Co., Chicago, Ill.
McCabe, J. J., New York City.
Motch & Merryweather Machy. Co., Cleveland.
Newton Mch. Tool Wks., Inc., Philadelphia.
Niles-Bement-Pond Co., New York City.
Warner & Swasey Co., Cleveland, O.

WHERE TO BUY

MACHINERY.
(Mining.)
McMyler Interstate Co., Cleveland, O.
Prescott Steam Pump Wks., Milwaukee, Wis.
Thew Automatic Shovel Co., Lorain, O.

MACHINERY.
(Molding.)
Arcade Mfg. Co., Freeport, Ill.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

MACHINERY.
(Nut Facing.)
Newton Mch. Tool Wks., Inc., Philadelphia.

MACHINERY.
(Pipe Mill.)
Landis Machine Co., Waynesboro, Pa.
Standard Engineering Co., Ellwood City, Pa.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wheeling Mold & Fdy. Co., Pittsburgh, Pa.
Williams Tool Co., Erie, Pa.

MACHINERY.
(Planing.)
Newton Mch. Tool Wks., Inc., Philadelphia.

MACHINERY.
(Rolling Mill.)
Alliance Machine Co., Alliance, O.
Bertsch & Co., Cambridge City, Ind.
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Blake & Johnson Co., Waterbury, Conn.
Bucyrus Steel Casting Co., Bucyrus, O.
Farrel Foundry & Mch. Co., Ansonia, Conn.
Fawcus Machine Co., Pittsburgh, Pa.
Garrison, A., Foundry Co., Pittsburgh, Pa.
Hyde Park Fdy. & Mch. Co., Hyde Park, Pa.
Johnston & Jennings Co., Cleveland, O.
Lake Erie Engineering Works, Buffalo, N. Y.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Morgon Construction Co., Worcester, Mass.
Morgan Engineering Co., Alliance, O.
Newbold, R. S., & Son Co., Norristown, Pa.
Standard Engineering Co., Ellwood City, Pa.
Tod Co., Wm., Youngstown, O.
Union Fdy. & Mach. Co., Pittsburgh, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Waterbury Farrel Fdy. & Mch. Co., Waterbury, Ct.
Wellman-Seaver-Morgan Co., Cleveland, O.
Wheeling Mold & Fdy. Co., Pittsburgh, Pa.
Youngstown Fdy. & Mchy. Co., Youngstown, O.

MACHINERY.
(Screw, Automatic.)
Bickford Machine Co., Greenfield, Mass.
Cook Co., Asa S., Hartford, Conn.
Davenport Mch. Tool Co., New Bedford, Mass.

MACHINERY.
(Second Hand.)
Baird Machinery Co., Pittsburgh, Pa.
McCabe, J. J., New York City.
Motch & Merryweather Machy. Co., Cleveland.
Ryerson, Jos. T., & Son, Chicago, Ill.
Stewart Co., Paul, Cincinnati, O.
Strong, Carlisle & Hammond Co., Cleveland, O.
Toomey, Frank, Philadelphia, Pa.

MACHINERY.
(Shearing.)
Bertsch & Co., Cambridge City, Ind.
Erie Foundry Co., Erie, Pa.

MACHINERY.
(Sheet Metal Working.)
Bertsch & Co., Cambridge City, Ind.
Bliss Co., E. W., Brooklyn, N. Y.
Dreis & Krump Mfg. Co., Chicago, Ill.

MACHINERY.
(Shovel.)
Bertsch & Co., Cambridge City, Ind.
Toledo Machine & Tool Co., Toledo, O.

MACHINERY.
(Special.)
Bethlehem Steel Co., So. Bethlehem, Pa.
Bilgram Machine Works, Philadelphia, Pa.
Blake & Johnson Co., Waterbury, Conn.
Bliss Co., E. W., Brooklyn, N. Y.
Bucyrus Steel Casting Co., Bucyrus, O.
Davenport Mach. Tool Co., New Bedford, Mass.
Fawcus Machine Co., Pittsburgh, Pa.
Foote Bros. Gear & Mach. Co., Chicago, Ill.
Kilby Mfg. Co., Cleveland, O.
Manning, Maxwell & Moore, Inc., New York.
Merrill Bros., Maspeth, N. Y.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
Sackmann Mfg. Co., Akron, O.
Tod Co., Wm., Youngstown, O.
Wheeling Mold & Fdy. Co., Pittsburgh, Pa.

MACHINERY.
(Spike and Nail.)
National Machinery Co., Tiffin, O.

MACHINERY.
(Tapping.)
Baker Bros., Toledo, O.
Modern Tool Co., Erie, Pa.

MACHINERY.
(Thread Rolling.)
Blake & Johnson Co., Waterbury, Conn.

MACHINERY.
(Tin House.)
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Mesta Machine Co., Pittsburgh, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wheeling Mold & Fdy. Co., Pittsburgh, Pa.

MACHINERY.
(Wire Drawing, Wire and Rivet Works.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

MACHINERY.
(Wire.)
Blake & Johnson Co., Waterbury, Conn.

MACHINERY.
(Wire Galvanizing, Wire Tinning, Wire Nails.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

MACHINERY.
(Wire Nails and Staples, Wire Nail Mills.)
Kilby Mfg. Co., Cleveland, O.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

MAGNESITE.
American Refractories Co., Chicago, Ill.

MAGNESITE.
(Dead Burned.)
Stowe-Fuller Co., Cleveland, O.

MAGNETS.
(Lifting.)
Cutler-Hammer Clutch Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., Cleveland, O.

METAL.
(Antimony, Copper.)
Blackwell, Geo. G., Sons & Co., Liverpool, Eng.

METAL.
(Babbitt.)
Riverside Metal Refining Co., Connellsville, Pa.

METAL.
(Expanded.)
Youngstown Iron & Steel Co., Youngstown, O.

METAL.
(Perforated.)
Hendrick Mfg. Co., Carbondale, Pa.

MILLS.
(Billet.)
Morgan Construction Co., Worcester, Mass.

MILLS.
(Continuous Rolling.)
Morgan Construction Co., Worcester, Mass.

MILLS.
(Wire Complete Equipment.)
Blake & Johnson Co., Waterbury, Conn.
Morgan Construction Co., Worcester, Mass.
Waterbury Farrel Fdy. & Mch. Co., Waterbury, Conn.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

MODELS.
(Made to Order.)
Standard Pattern Works Co., Cleveland, O.

MOLDS.
(Ingot.)
Carnegie Steel Co., Pittsburgh, Pa.
Interstate Foundry Co., Cleveland, O.
Marshall Foundry Co., Pittsburgh, Pa.
Wheeling Mold & Fdy. Co., Pittsburgh, Pa.
Youngstown Fdy. & Mch. Co., Youngstown, O.

MOTORS.
(Air.)
Detroit Hoist & Machine Co., Detroit, Mich.
Westinghouse Elec. & Mfg. Co., Pittsburgh.

MOTORS.
(Electric D. C. and A. C.
Crocker-Wheeler Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., Pittsburgh.

MOTORS.
(Mill.)
Crocker-Wheeler Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., Pittsburgh.

NAILS.
American Steel & Wire Co., Chicago, Ill.
Cambria Steel Co., Johnstown, Pa.
Corbin Screw Corpn., New Britain, Conn.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
La Belle Iron Works, Steubenville, O.
Newport Rolling Mill Co., Newport, Ky.
Pittsburgh Steel Co., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

NIPPLES.
Cressman-Kleinman Mfrs. Co., Philadelphia, Pa.

NUTS.
American Bridge Co. of New York, New York.
American Iron & Steel Mfg. Co., Lebanon, Pa.
Atlas Bolt & Screw Co., Cleveland, O.
Bourne-Fuller Co., Cleveland, O.
Cleveland City Forge & Iron Co., Cleveland.
Corbin Screw Corpn., New Britain, Conn.
Garland Nut & Rivet Co., Pittsburgh, Pa.
Lockhart Iron & Steel Co., Pittsburgh, Pa
Milton Mfg. Co., Milton, Pa.
Oliver Iron & Steel Co., Pittsburgh, Pa.
Republic Iron & Steel Co., Youngstown, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scully Steel & Iron Co., Chicago, Ill.
Steel Car Forge Co., Pittsburgh, Pa.
Upson Nut Co., Cleveland, O.

NUTS.
(Hot Pressed.)
American Iron & Steel Mfg. Co., Lebanon, Pa.
Bourne-Fuller Co., Cleveland, O.
Milton Mfg. Co., Milton, Pa.
Republic Iron & Steel Co., Youngstown, O.
Upson Nut Co., Cleveland, O.

ORE.
(Chrome.)
Blackwell, Geo. G., Sons & Co., Ltd., Liverpool, Eng.
Samuel, Frank, Philadelphia, Pa.

ORE.
(Iron.)
Blackwell, Geo. G., Sons & Co., Ltd., Liverpool, Eng.
Breitung, E. N., & Co., Cleveland, O.
Hanna, M. A., & Co., Cleveland, O.
Hillman & Son, J. H., Pittsburgh, Pa.
La Belle Iron Works, Steubenville, O.
Oglebay, Norton & Co., Cleveland, O.
Pickands, Brown & Co., Chicago, Ill.
Pickands, Mather & Co., Cleveland, O.
Snyder & Co., W. P., Pittsburgh, Pa.
Tod-Stambaugh Co., Cleveland, O.

OVENS.
Koppers Co., H., Chicago, Ill.

OVENS.
(By-Products Coke Ovens.)
Coal Distillation Co., New York, N. Y.
Koppers Co., H., Chicago, Ill.
United Coke & Gas Co., New York City.

OVENS.
(Coke.)
Coal Distillation Co., New York, N. Y.
Koppers Co., H., Chicago, Ill.
United Coke & Gas Co., New York City.

OVENS.
(Core.)
Obermayer, S., Co., Cincinnati, O.

PAILS.
(Foundry.)
Geuder, Paeschke & Frey Co., Milwaukee, Wis.

PANS.
(Grinding.)
Phillips & McLaren Co., Pittsburgh, Pa.

PANS.
(Lathe.)
New Britain Machine Co., New Britain, Conn.

PATTERNS.
Arcade Mfg. Co., Freeport, Ill.
Mummert-Dixon Co., Hanover, Pa.
Standard Pattern Wks. Co., The, Cleveland, O.
Youngstown Fdy. & Mch. Co., Youngstown, O.

PERFORATING.
(Sheet Metal-Automatic, Screen Work.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

PILING.
(Steel Sheet Interlocking.)
Carnegie Steel Co., Pittsburgh, Pa.
Jones & Laughlin Steel Co., Pittsburgh, Pa.

WHERE TO BUY

PINIONS.
General Electric Co., Schenectady, N. Y.
Nuttall, R. D., Co., Pittsburgh, Pa.
Van Dorn & Dutton Co., Cleveland, O.

PINIONS.
(Rawhide.)
Chicago Rawhide Mfg. Co., Chicago, Ill.
Ganschow, Wm., Co., Chicago, Ill.
Horsburgh & Scott Co., Cleveland, O.
New Process Rawhide Co., Syracuse, N. Y.
Nuttall, R. D., Co., Pittsburgh, Pa.

PINS.
(Knuckle and Brake.)
Champion Rivet Co., Cleveland, O.
Oliver Iron & Steel Co., Pittsburgh, Pa.

PINS.
(Pivot.)
Champion Rivet Co., Cleveland, O.

PIPE.
Bourne-Fuller Co., Cleveland, O.
Central Tube Co., Pittsburgh, Pa.
Cressman-Kleinman Mfrs. Co., Philadelphia, Pa.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Pittsburgh Valve, Fdy. & Const. Co., Pittsburgh.
Shaw-Kendall Engrg. Co., Toledo, O.
Struthers-Wells Co., Warren, Pa.
U. S. Cast Iron Pipe & Fdy. Co., New York.
Youngstown Sheet & Tube Co., Youngstown, O.

PIPE.
(Drive, Iron and Steel.)
Republic Iron & Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, O.

PIPE.
(Iron and Steel, Galvanized.)
Youngstown Sheet & Tube Co., Youngstown, O.

PIPE.
(Line, Iron and Steel.)
Youngstown Sheet & Tube Co., Youngstown, O.

PIPE.
(Riveted Steel.)
American Bridge Co. of New York, New York.
Cambria Steel Co., Johnstown, Pa.
Graver Tank Wks., Wm., East Chicago, Ind.
Riter-Conley Mfg. Co., Pittsburgh, Pa.
Struthers-Wells Co., Warren, Pa.

PIPE.
(Wrought Iron.)
Bourne-Fuller Co., Cleveland, O.
Cressman-Kleinman Mfrs. Co., Philadelphia, Pa.
National Tube Co., Pittsburgh, Pa.
Pittsburgh Piping & Equip. Co., Pittsburgh.
Youngstown Sheet & Tube Co., Youngstown, O.

PLANERS.
Cincinnati Shaper Co., Cincinnati, O.
Cleveland Planer Works, Cleveland, O.
Cleveland Punch & Shear Wks. Co., Cleveland.
Manning, Maxwell & Moore, Inc., New York.
Motch & Merryweather Mchy. Co., Cleveland.
Ryerson, Joseph T., & Son, Chicago, Ill.

PLANTS.
(By-Products Coke Ovens.)
Koppers Co., H., Chicago, Ill.

PLATE.
(Tin.)
American Sheet & Tin Plate Co., Pittsburgh.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Phillips Sheet & Tin Plate Co., Weirton, W. Va.
Standard Tin Plate Co., Canonsburg, Pa.
Taylor, N. & G., Philadelphia, Pa.

PLATES.
American Rolling Mill Co., Middletown, O.
Bourne-Fuller Co., Cleveland, O.
Brier Hill Steel Co., Youngstown, O.
Cambria Steel Co., Johnstown, Pa.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago.
Illinois Steel Warehouse Co., St. Louis, Mo.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
La Belle Iron Works, Steubenville, O.
Newport Rolling Mill Co., Newport, Ky.
Otis Steel Co., Cleveland, O.
Portsmouth Steel Co., Portsmouth, O.
Republic Iron & Steel Co., Youngstown, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Taylor, N. & G., Co., Philadelphia, Pa.
Tenn. Coal, Iron & R. R. Co., Birmingham, Ala.
United Steel Co., Canton, O.
Wood, Alan, Iron & Steel Co., Philadelphia.
Worth Bros. Co., Coatesville, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

PLATES.
(Boiler and Tank.)
American Rolling Mill Co., Middletown, O.
Andrews Steel Co., Newport, Ky.
Bourne-Fuller Co., Cleveland, O.
Brown-Wales Co., Boston, Mass.
La Belle Iron Wks., Steubenville, O.
Newport Rolling Mill Co., Newport, Ky.
Otis Steel Co., Cleveland, O.
Portsmouth Steel Co., Portsmouth, O.
Ryerson & Son, Jos. T., Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Worth Bros. Co., Coatesville, Pa.

PLATES.
(Felloe.)
Wrought Washer Mfg. Co., Milwaukee, Wis.

PLATES.
(Floor.)
Carnegie Steel Co., Pittsburgh, Pa.
National Tube Co., Pittsburgh, Pa.

PLATES.
(Sheared.)
Allegheny Steel Co., Pittsburgh, Pa.
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Johnstown, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Illinois Steel Co., Chicago, Ill.
Newport Rolling Mill Co., Newport, Ky.
Portsmouth Steel Co., Portsmouth, O.

PLATES.
(Tie.)
Illinois Steel Co., Chicago, Ill.

PLATES.
(Universal.)
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Illinois Steel Co., Chicago, Ill.
La Belle Iron Wks., Steubenville, O.
United Steel Co., Canton, O.
Youngstown Sheet & Tube Co., Youngstown, O.

PLUMBAGO.
Detroit Foundry Supply Co., Detroit, Mich.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Ilsley, Doubleday & Co., New York City.
Obermayer, S., Co., Cincinnati, O.

POINTERS.
(Wire Rod, Wire Mills.)
Turner, Vaughn & Taylor Co.,
Cuyahoga Falls, O.

PRESSES.
Birdsboro Steel Fdy. & Mch. Co.,
Birdsboro, Pa.
Bliss, E. W., Co., Brooklyn, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cleveland Punch & Shear Wks. Co., Cleveland.
Dreis & Krump Mfg. Co., Chicago, Ill.
Ferracute Machine Co., Bridgeton, N. J.
Lake Erie Engineering Works, Buffalo, N. Y.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.
Ryerson & Son, Jos. T., Chicago, Ill.
Tod Co., Wm., Youngstown, O.
Toledo Machine & Tool Co., Toledo, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Waterbury Farrel Fdy. & Mch. Co., Wt'b'y, Ct.
Wood, R. D., Co., Philadelphia, Pa.

PRESSES.
(Baling.)
Logemann Bros. Co., Milwaukee, Wis.

PRESSES.
(Forging.)
Morgan Engineering Co., Alliance, O.
Tod Co., Wm., Youngstown, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

PRESSES.
(Hydraulic.)
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Tod Co., Wm., Youngstown, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

PRESSES.
(Metal Scrap.)
Logemann Bros. Co., Milwaukee, Wis.

PRESSES.
(Steam, Sleeves, Runner Brick, Nozzles and Tuyeres. Fire Brick Works.)
Turner, Vaughn & Taylor Co.,
Cuyahoga Falls, O.

PRESSES.
(Trimming.)
Massillon Fdy. & Mach. Co., Massillon, O.

PRODUCERS.
(Gas.)
Cooper, C. & G., Co., Mt. Vernon, O.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
Hagan, Geo. J., Pittsburgh, Pa.
Koppers Co., H., Chicago, Ill.
Morgan Construction Co., Worcester, Mass.
Struthers-Wells Co., Warren, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.

PULLEYS.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Oneida Steel Pulley Co., Oneida, N. Y.

PUMPS.
Aldrich Pump Dept., Allentown, Pa.
Cameron, A. S., Steam Pump Wks., New York.
Dean Bros. Steam Pump Wks., Indianapolis.
Deming Co., Salem, O.
Hooven, Owens & Rentschler Co., Hamilton, O.
Lake Erie Engrg. Works, Buffalo, N. Y.
Prescott Steam Pump Co., Milwaukee, Wis.
Southwark Foundry & Mach. Co., Philadelphia.
Tod Co., Wm., Youngstown, O.

PUMPS.
(Bank.)
Dean Bros. Steam Pump Wks., Indianapolis.

PUMPS.
(Boiler Feed.)
Cameron, A. S., Steam Pump Wks., New York.
Dean Bros. Steam Pump Wks., Indianapolis.
Deming Co., Salem, O.
Prescott Steam Pump Co., Milwaukee, Wis.
Virginia Fdry. & Mach. Co., Virginia, Minn.

PUMPS.
(Compound.)
Dean Bros. Steam Pump Wks., Indianapolis.

PUMPS.
(Deep Well.)
Dean Bros. Steam Pump Wks., Indianapolis.
Deming Co., Salem, O.
Hall Steam Pump Co., Pittsburgh, Pa.

PUMPS.
(Electric Driven.)
Aldrich Pump Dept., Allentown, Pa.
Dean Bros. Steam Pump Wks., Indianapolis.
Deming Co., Salem, O.

PUMPS.
(Elevator.)
Dean Bros. Steam Pump Wks., Indianapolis.

PUMPS.
(Hydraulic.)
Dean Bros. Steam Pump Wks., Indianapolis.
Deming Co., Salem, O.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Prescott Steam Pump Co., Milwaukee, Wis.

PUMPS.
(Mine.)
Dean Bros. Steam Pump Wks., Indianapolis.
Deming Co., Salem, O.
Prescott Steam Pump Co., Milwaukee, Wis.

PUMPS.
(Steam.)
Cameron, A. S., Steam Pump Wks., New York.
Dean Bros. Steam Pump Wks., Indianapolis.
Hall Steam Pump Co., Pittsburgh, Pa.
Pittsburgh Valve Fdy. & Const. Co., Pittsbgh.
Prescott Steam Pump Co., Milwaukee, Wis.

PUMPS.
(Vacuum.)
Cameron, A. S., Steam Pump Wks., New York.
Dean Bros. Steam Pump Wks., Indianapolis.
Deming Co., Salem, O.
Hall Steam Pump Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.

PUNCHES AND SHEARS.
Allen, John F., Co., New York City.
Alliance Machine Co., Alliance, O.
Bertsch & Co., Cambridge City, Ind.
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Bliss, E. W., Co., Brooklyn, N. Y.
Cleveland Punch & Shear Wks. Co., Cleveland.
Covington Mch. Co., Covington, Va.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Massillon Fdy. & Mach. Co., Massillon, O.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Standard Bridge Tool Co., Pittsburgh, Pa.
Tod Co., Wm., Youngstown, O.
Toledo Machine & Tool Co., Toledo, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wood, R. D., & Co., Philadelphia, Pa.

PUNCHES.
(Hand.)
Bertsch & Co., Cambridge City, Ind.
Bourne-Fuller Co., Cleveland, O.

PUNCHES.
(Hydraulic.)
[illegible] & Co., Cambridge City, Ind.
[illegible], Wm., Youngstown, O.

PUNCHES.
(Multiple.)
Bertsch & Co., Cambridge City, Ind.
Bliss Co., E. W., Brooklyn, N. Y.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.

PUNCHES.
(Pneumatic.)
Allen, John F., Co., New York City.

PYROMETERS.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia, Pa.
Stupakoff Laboratories, Pittsburgh, Pa.
Thwing Instrument Co., Philadelphia, Pa.

RACKS.
(Steel or Tool.)
New Britain Mach. Co., New Britain, Conn.

WHERE TO BUY

RAILS.
Bourne-Fuller Co., Cleveland, O.
Buckeye Rolling Mill Co., Steubenville, O.
Cambria Steel Co., Johnstown, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Foster Co., L. B., Pittsburgh, Pa.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago.
Illinois Steel Warehouse Co., St. Louis, Mo.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Tenn. Coal, Iron & R. R. Co., Birmingham, Ala.

RAMMERS.
(Foundry.)
Ingersoll-Rand Co., New York.

REAMERS.
Morse Twist Drill & Mach. Co.,
New Bedford, Mass.

RECEIVERS.
(Air.)
Graver Tank Wks., Wm., E. Chicago, Ind.
Ingersoll-Rand Co., New York.

REELS.
(Wood and Iron, Wire Mills.)
Turner, Vaughn & Taylor Co.,
Cuyahoga Falls, O.

REGENERATORS.
Coal Distillation Co., New York, N. Y.

REGULATORS.
(Boiler Feed Water, Open Feed Water Heater and Pressure.)
Strong, Carlisle & Hammond Co., Cleveland.

REGULATORS.
(Speed.)
Cutler-Hammer Mfg. Co., Milwaukee, Wis.

RIVETERS.
(Hydraulic.)
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York, N. Y.
Wood & Co., R. D., Philadelphia, Pa.

RIVETERS.
(Pneumatic.)
Allen, John F., Co., New York City.
Cleveland Pneumatic Tool Co., Cleveland, O.
Ingersoll-Rand Co., New York.
Ryerson, Jos. T., & Son, Chicago, Ill.

RIVETS.
(Structural, Boiler, Ship.)
American Iron & Steel Mfg. Co., Lebanon, Pa.
Bourne-Fuller Co., Cleveland, O.
Champion Rivet Co., Cleveland, O.
Clark Bros. Bolt Co., Milldale, Conn.
Garland Nut & Rivet Co., Pittsburgh, Pa.
Illinois Steel Co., Warehouse Dept., Chicago.
Illinois Steel Warehouse Co., St. Louis, Mo.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Lockhart Iron & Steel Co., Pittsburgh, Pa.
Oliver Iron & Steel Co., Pittsburgh, Pa.
Progressive Mfg. Co., Torrington, Conn.
Republic Iron & Steel Co., Youngstown, O.
Russell, Burdsall & Ward Bolt & Nut Co.,
Port Chester, N. Y.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Steel Car Forge Co., Pittsburgh, Pa.
Upson Nut Co., Cleveland, O.

RODS.
(Drill, Polished.)
Bourne-Fuller Co., Cleveland, O.

RODS.
(Iron and Steel.)
American Iron & Steel Mfg. Co., Lebanon, Pa.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Upson Nut Co., Cleveland, O.
Youngstown Sheet & Tube Co., Youngstown, O.

RODS.
(Straightened and Cut.)
Youngstown Sheet & Tube Co., Youngstown, O.

RODS.
(Wire.)
American Steel & Wire Co., Chicago, Ill.

ROLLS.
(Bending and Straightening.)
Bertsch & Co., Cambridge City, Ind.
Morgan Engineering Co., Alliance, O.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

ROLLS.
(Sand Chilled and Steel.)
Birdsboro Steel Fdy. & Mch. Co.,
Birdsboro, Pa.
Farrel Fdy. & Mach. Co., Ansonia, Conn.
Garrison Fdy. Co., A., Pittsburgh, Pa.
Hyde Park Fdy. & Mch. Co., Hyde Park, Pa.
Mesta Machine Co., Pittsburgh, Pa.
National Roll & Foundry Co., Avonmore, Pa.
Seaman, Sleeth Co., Pittsburgh, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wheeling Mold & Fdy. Co., Pittsburgh, Pa.
Youngstown Fdy. & Mch. Co., Youngstown, O.

ROOFING.
Hydrex Felt & Engineering Co., New York.

ROOFING.
(Corrugated.)
American Rolling Mill Co., Middletown, O.
Amer. Sheet & Tin Plate Co., Pittsburgh, Pa.
Brier Hill Steel Co., Youngstown, O.
Inland Steel Co., Chicago, Ill.
Newport Rolling Mill Co., Newport, Ky.
Seneca Iron & Steel Co., Buffalo, N. Y.
Stark Rolling Mill Co., Canton, O.
Youngstown Sheet & Tube Co., Youngstown, O.

ROOFING.
(Iron and Steel.)
American Bridge Co. of New York, New York.
American Rolling Mill Co., Middletown, O.
Amer. Sheet & Tin Plate Co., Pittsburgh, Pa.
Brier Hill Steel Co., Youngstown, O.
Inland Steel Co., Chicago, Ill.
Massillon Rolling Mill Co., Massillon, O.
Newport Rolling Mill Co., Newport, Ky.
Portsmouth Steel Co., Portsmouth, O.
Wood, Alan, Iron & Steel Co., Philadelphia.
Youngstown Iron & Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, O.

ROPE.
(Wire.)
American Steel & Wire Co., Chicago, Ill.

SAND.
(Molding.)
Garden City Sand Co., Chicago, Ill.
Ohio Sand Co., Conneaut, O.

SAND BLAST.
(Chilled Shot for use in)
Globe Steel Co., Mansfield, O.

SAND BLAST EQUIPMENT.
Sly, W. W., Mfg. Co., Cleveland, O.

SASH.
(Window-Steel.)
Detroit Steel Products Co., Detroit, Mich.
Trussed Concrete Steel Co., Detroit, Mich.

SATURATORS.
(Ammonia.)
Koppers Co., H., Chicago, Ill.

SAWS.
(Cold Metal.)
Disston, Henry & Sons, Inc., Philadelphia, Pa.
Espen-Lucas Mach. Wks., Philadelphia, Pa.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Newton Mch. Tool Wks., Inc., Philadelphia.
Starrett, L. S., Co., Athol, Mass.

SAWS.
(Hot.)
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wheeling Mold & Fdy. Co., Pittsburgh, Pa.

SCREENS.
Hendrick Mfg. Co., Carbondale, Pa.

SCREWS.
American Iron & Steel Mfg. Co., Lebanon, Pa.
Atlas Bolt & Screw Co., Cleveland, O.
Corbin Screw Corpn., New Britain, Conn.
Milton Mfg. Co., Milton, Pa.
Pittsburgh Screw & Bolt Co., Pittsburgh, Pa.
Progressive Mfg. Co., Torrington, Conn.
Republic Iron & Steel Co., Youngstown, O.
Russell, Burdsall & Ward Bolt & Nut Co.,
Port Chester, N. Y.

SCREWS.
(Automobile.)
New Haven Mch. Screw Co., New Haven, Ct.

SCREWS.
(Collar.)
New Haven Mch. Screw Co., New Haven, Ct.

SCREWS.
(Hexagon, Head Cap.)
New Haven Mch. Screw Co., New Haven, Ct.

SCREWS.
(Set.)
Allen Mfg. Co., Inc., Hartford, Conn.
Clark Bros. Bolt Co., Milldale, Conn.
Corbin Screw Corpn., New Britain, Conn.
New Haven Mch. Screw Co., New Haven, Ct.

SEPARATORS.
(Centrifugal Oil.)
American Tool & Machine Co., Boston, Mass.
National Separator & Mach. Co., Boston, Mass.

SEPARATORS.
(Magnetic.)
Cutler-Hammer Clutch Co., Milwaukee, Wis.

SEPARATORS.
(Steam or Oil.)
Strong, Carlisle & Hammond Co., Cleveland.

SHAFTING.
American Steel & Wire Co., Chicago, Ill.
Bourne-Fuller Co., Cleveland, O.
Cincinnati Iron & Steel Co., Cincinnati, O.
Columbia Steel & Shafting Co., Pittsburgh, Pa.
Gem Mfg. Co., Pittsburgh, Pa. (Flexible.)
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Republic Iron & Steel Co., Youngstown, O.
Scully Steel & Iron Co., Chicago, Ill.
Standard Gauge Steel Co., Beaver Falls, Pa.
Union Drawn Steel Co., Beaver Falls, Pa.

SHAFTING.
(Cold Drawn or Rolled.)
Bourne-Fuller Co., Cleveland, O.
Columbia Steel & Shafting Co., Pittsburgh, Pa.
Republic Iron & Steel Co., Youngstown, O.

SHAFTING.
(Turned.)
Bourne-Fuller Co., Cleveland, O.
Columbia Steel & Shafting Co., Pittsburgh, Pa.

SHAPERS.
Cincinnati Shaper Co., Cincinnati, O.
Cleveland Punch & Shear Wks. Co., Cleveland.
Manning, Maxwell & Moore, Inc., New York.
McCabe, J. J., New York City.
Motch & Merryweather Machy. Co., Cleveland.
Newton Mch. Tool Wks., Inc., Philadelphia.
Niles-Bement-Pond Co., New York City.

SHAPES.
(Agricultural.)
Carnegie Steel Co., Pittsburgh, Pa.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Laclede Steel Co., St. Louis, Mo.
Republic Iron & Steel Co., Youngstown, O.

SHAPES.
(Steel, Structural and Special Rolled.)
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Johnstown, Pa.
Illinois Steel Co., Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.

SHEARS.
(Angle and Plate.)
Bertsch & Co., Cambridge City, Ind.

SHEARS.
(Billet, Bloom and Slab.)
Garrison, A., Foundry Co., Pittsburgh, Pa.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wheeling Mold & Fdy. Co., Pittsburgh, Pa.

SHEARS.
(Flying and Bar.)
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.

SHEARS.
(Lever.)
Bertsch & Co., Cambridge City, Ind.
Mesta Machine Co., Pittsburgh, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wheeling Mold & Fdy. Co., Pittsburgh, Pa.

SHEARS.
(Scrap, Alligator, Wire and Wire Nail Mills.)
Covington Machine Co., Covington, Va.
Turner, Vaughn & Taylor Co.,
Cuyahoga Falls, O.

SHEARS.
(Squaring.)
Bertsch & Co., Cambridge City, Ind.
Bliss Co., E. W., Brooklyn, N. Y.
Garrison, A., Foundry Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wheeling Mold & Fdy. Co., Pittsburgh, Pa.

SHEARS.
(Vertical.)
Bertsch & Co., Cambridge City, Ind.
Mesta Machine Co., Pittsburgh, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

SHEETS.
(Black Steel.)
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburgh.
Bourne-Fuller Co., Cleveland, O.
Brier Hill Steel Co., Youngstown, O.
Canton Sheet Steel Co., Canton, O.
Cincinnati Iron & Steel Co., Cincinnati, O.
Inland Steel Co., Chicago, Ill.
Newport Rolling Mill Co., Newport, Ky.
Portsmouth Steel Co., Portsmouth, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Seneca Iron & Steel Co., Buffalo, N. Y.
Stark Rolling Mill Co., Canton, O.
Youngstown Iron & Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS.
(Blue Annealed.)
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburgh.
Andrews Steel Co., Newport, Ky.
Bourne-Fuller Co., Cleveland, O.
Inland Steel Co., Chicago, Ill.
Newport Rolling Mill Co., Newport, Ky.
Portsmouth Steel Co., Portsmouth, O.
Seneca Iron & Steel Co., Buffalo, N. Y.
Stark Rolling Mill Co., Canton, O.
Youngstown Sheet & Tube Co., Youngstown, O.

WHERE TO BUY

SHEETS.
(Corrugated.)
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburgh.
Bourne-Fuller Co., Cleveland, O.
Brier Hill Steel Co., Youngstown, O.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Massillon Rolling Mill Co., Massillon, O.
Newport Rolling Mill Co., Newport, Ky.
Portsmouth Steel Co., Portsmouth, O.
Ryerson & Son, Jos. T., Chicago, Ill.
Seneca Iron & Steel Co., Buffalo, N. Y.
Stark Rolling Mill Co., Canton, O.
Youngstown Iron & Steel Co., Youngstown,O.
Youngstown Sheet & Tube Co., Youngstown,O.

SHEETS.
(Dead Soft for Stamping.)
Allegheny Steel Co., Pittsburgh, Pa.
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburgh.
Bourne-Fuller Co., Cleveland, O.
Canton Sheet Steel Co., Canton, O.
Inland Steel Co., Chicago, Ill.
Phillips Sheet & Tin Plate Co., Weirton, W. Va.
Portsmouth Steel Co., Portsmouth, O.
Seneca Iron & Steel Co., Buffalo, N. Y.
Stark Rolling Mill Co., Canton, O.
Youngstown Iron & Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown,O.

SHEETS.
(Deep Drawing Stock.)
Allegheny Steel Co., Pittsburgh, Pa.
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburgh.
Bourne-Fuller Co., Cleveland, O.
Inland Steel Co., Chicago, Ill.
Massillon Rolling Mill Co., Massillon, O.
Phillips Sheet & Tin Plate Co., Weirton, W. Va.
Youngstown Iron & Steel Co., Youngstown, O.

SHEETS.
(Galvanized.)
Allegheny Steel Co., Pittsburgh, Pa.
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburgh.
Bourne-Fuller Co., Cleveland, O.
Canton Sheet Steel Co., Canton, O.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Massillon Rolling Mill Co., Massillon, O.
Newport Rolling Mill Co., Newport, Ky.
Portsmouth Steel Co., Portsmouth, O.
Republic Iron & Steel Co., Youngstown, O.
Ryerson & Son, Jos. T., Chicago, Ill.
Seneca Iron & Steel Co., Buffalo, N. Y.
Stark Rolling Mill Co., Canton, O.
Wood, Alan, Iron & Steel Co., Philadelphia.
Youngstown Iron & Steel Co., Youngstown, O.
Youngstown Sh't & Tube Co., Youngstown, O.

SHEETS.
(Iron and Steel.)
Allegheny Steel Co., Pittsburgh, Pa.
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburgh.
Bourne-Fuller Co., Cleveland, O.
Brier Hill Steel Co., Youngstown, O.
Canton Sheet Steel Co., Canton, O.
Disston & Sons, Inc., Henry, Philadelphia.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago.
Illinois Steel Warehouse Co., St. Louis, Mo.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Massillon Rolling Mill Co., Massillon, O.
Newport Rolling Mill Co., Newport, Ky.
Phillips Sheet & Tin Plate Co., Weirton, W. Va.
Portsmouth Steel Co., Portsmouth, O.
Republic Iron & Steel Co., Youngstown, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Seneca Iron & Steel Co., Buffalo, N. Y.
Stark Rolling Mill Co., Canton, O.
Tennessee Coal, Iron & R. R. Co., Pittsburgh
Wood, Alan, Iron & Steel Co., Philadelphia.
Worth Bros. Co., Coatesville, Pa.
Youngstown Sheet & Tube Co., Youngstown,O.

SHEETS.
(Open-Hearth.)
American Sheet & Tin Plate Co., Pittsburgh.
Bourne-Fuller Co., Cleveland, O.
Canton Sheet Steel Co., Canton, O.
Inland Steel Co., Chicago, Ill.
Newport Rolling Mill Co., Newport, Ky.
Portsmouth Steel Co., Portsmouth, O.
Seneca Iron & Steel Co., Buffalo, N. Y.
Stark Rolling Mill Co., Canton, O.
Youngstown Iron & Steel Co., Youngstown, O.

SHEETS.
(Pickled and Cold Rolled.)
American Sheet & Tin Plate Co., Pittsburgh.
Bourne-Fuller Co., Cleveland, O.
Canton Sheet Steel Co., Canton, O.
Inland Steel Co., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS.
(Polished.)
American Sheet & Tin Plate Co., Pittsburgh.
Bourne-Fuller Co., Cleveland, O.
Canton Sheet Steel Co., Canton, O.
Newport Rolling Mill Co., Newport, Ky.

SHEETS.
(Steel Box Annealed.)
American Sheet & Tin Plate Co., Pittsburgh.
Canton Sheet Steel Co., Canton, O.
Youngstown Iron & Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown,O.

SHELVING.
(Steel.)
New Britain Mach. Co., New Britain, Conn.

SHOVELS.
(Steam.)
Bucyrus Co., South Milwaukee, Wis.
Thew Automatic Shovel Co., Lorain, O.

SIFTERS.
(Sand.)
Arcade Mfg. Co., Freeport, Ill.
Whiting Fdy. Equipment Co., Harvey, Ill.

SLABS.
Andrews Steel Co., Newport, Ky.
Cambria Steel Co., Johnstown, Pa.
La Belle Iron Works, Steubenville, O.
Portsmouth Steel Co., Portsmouth, O.
United Steel Co., Canton, O.
Youngstown Sheet & Tube Co., Youngstown,O.

SLABS.
(Sheet.)
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Tennessee Coal, Iron & R. R. Co., Bm'gh'm, Ala.
United Steel Co., Canton, O.
Youngstown Sheet & Tube Co., Youngstown,O.

SPECIALTIES.
(Steam.)
Cameron, A. S., Steam Pump Wks., New York.
National Tube Co., Pittsburgh, Pa.
Strong, Carlisle & Hammond Co., Cleveland.

SPIEGELEISEN.
Pickands, Brown & Co., Chicago, Ill.

SPIKES.
American Iron & Steel Mfg. Co., Lebanon, Pa.
American Steel & Wire Co., Chicago, Ill.
Cincinnati Iron & Steel Co., Cincinnati, O.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Republic Iron & Steel Co., Youngstown, O.

SPIKES.
(Screw.)
Illinois Steel Co., Chicago, Ill.
Steel Car Forge Co., Pittsburgh, Pa.

SPLICES.
(Rail.)
Carnegie Steel Co., Pittsburgh, Pa.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Republic Iron & Steel Co., Youngstown, O.

SPRINGS.
American Steel & Wire Co., Chicago, Ill.
Dunbar Bros. Co., Bristol, Conn.

SPRINGS.
(Vanadium.)
American Vanadium Co., Pittsburgh, Pa.

SPRINKLER SYSTEMS.
(Fire-Automatic.)
General Fire Extinguisher Co., Providence, R. I.

STACKS.
American Bridge Co. of New York, N. Y.
Des Moines Bridge & Iron Co.,
Des Moines, Ia., and Pittsburgh, Pa.
Freeman, S., & Sons, Mfg. Co., Racine, Wis.
Graver Tank Wks., Wm. E. Chicago, Ind.
Struthers-Wells Co., Warren, Pa.
Western Drop Forge Co., Marion, Ind.

STAMPING.
Acklin Stamping Co., Toledo, O.
Sackmann Mfg. Co., Akron, O.

STAMPING.
(Sheet Metal.)
Acklin Stamping Co., Toledo, O.
Bettcher Mfg. Co., Cleveland, O.
Geuder, Paeschke & Frey Co., Milwaukee.
Sterling Mch. & Stamping Co., Wellington, O.

STAMPS.
(Steel.)
Sackmann Mfg. Co., Akron, O.

STARTERS.
(Electric Motor.)
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Pittsburgh

STEEL.
American Bridge Co. of New York, N. Y.
Andrews Steel Co., Newport, Ky.
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Johnstown, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Colonial Steel Co., Pittsburgh, Pa.
Disston & Sons, Inc., Henry, Philadelphia.
Franklin Steel Co., Franklin, Pa.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago.
Illinois Steel Warehouse Co., St. Louis, Mo.
Inland Steel Co., Chicago, Ill.
Interstate Iron & Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
La Belle Iron Works, Steubenville, O.
Laclede Steel Co., St. Louis, Mo.
Lockhart Iron & Steel Co., Pittsburgh, Pa.
Otis Steel Co., Cleveland, O.
Portsmouth Steel Co., Portsmouth, O.
Reliance Steel Casting Co., Pittsburgh, Pa.
Republic Iron & Steel Co., Youngstown, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Southern Iron & Steel Co., Birmingham, Ala.
Tennessee Coal, Iron & R. R. Co., Bm'gh'm, Ala.
Upson Nut Co., Cleveland, O.
Wood, Alan, Iron & Steel Co., Philadelphia.
Youngstown Sheet & Tube Co., Youngstown,O.

STEEL.
(Axle.)
(Automobile Mining Car.)
Columbia Steel & Shafting Co., Pittsburgh.
Union Drawn Steel Co., Beaver Falls, Pa.

STEEL.
(Cold Rolled.)
Bourne-Fuller Co., Cleveland, O.
Columbia Steel & Shafting Co., Pittsburgh.
Newport Rolling Mill Co., Newport, Ky
Scully Steel & Iron Co., Chicago, Ill.

STEEL.
(Cold Drawn.)
Bourne-Fuller Co., Cleveland, O.
Columbia Steel & Shafting Co., Pittsburgh.
Standard Gauge Steel Co., Beaver Falls, Pa.
Union Drawn Steel Co., Beaver Falls, Pa.

STEEL.
(Electric.)
Illinois Steel Co., Chicago, Ill.
Newport Rolling Mill Co., Newport, Ky.

STEEL.
(High Speed.)
Allen, Edgar, & Co., Ltd., New York, N. Y.
Bethlehem Steel Co., So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Colonial Steel Co., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.

STEEL.
(Machinery.)
Sivyer Steel Casting Co., Milwaukee, Wis.

STEEL.
(Open-Hearth.)
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Johnstown, Pa.
Illinois Steel Co., Chicago, Ill.
Inland Steel Co., Chicago, Ill.
Portsmouth Steel Co., Portsmouth, O.
Union Drawn Steel Co., Beaver Falls, Pa.
Upson Nut Co., Cleveland, O.

STEEL.
(Screw Stock.)
Columbia Steel & Shafting Co., Pittsburgh.

STEEL.
(Structural.)
American Bridge Co. of New York, N. Y.
Bethlehem Steel Co., So. Bethlehem, Pa.
Blaw Steel Centering Co., Pittsburgh, Pa.
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Johnstown, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Eichleay, John Jr., Co., Pittsburgh, Pa.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago.
Illinois Steel Warehouse Co., St. Louis, Mo.
Independent Bridge Co., Pittsburgh, Pa.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Lackawanna Bridge Co., Buffalo, N. Y.
McClintic-Marshall Const. Co., Pittsburgh, Pa.
Portsmouth Steel Co., Portsmouth, O.
Republic Iron & Steel Co., Youngstown, O.
Riter-Conley Mfg. Co., Pittsburgh, Pa.
Ryerson, Joseph T., & Son, Chicago, Ill.
Worden-Allen Co., Chicago, Ill.

STEEL.
(Tool.)
Allen, Edgar & Co., Ltd., New York City.
Bethlehem Steel Co., So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Colonial Steel Co., Pittsburgh, Pa.
Disston & Sons, Inc., Henry, Philadelphia.
Firth-Sterling Steel Co., McKeesport, Pa.
Ryerson, Joseph T., & Son, Chicago, Ill.
Vanadium Alloys Steel Co., Latrobe, Pa.

STEEL.
(Twisted.)
Bourne-Fuller Co., Cleveland, O.
Franklin Steel Co., Franklin, Pa.
Upson Nut Co., Cleveland, O.

STEEL.
(Vanadium.)
American Vanadium Co., Pittsburgh, Pa.
Andrews Steel Co., Newport, Ky.
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Colonial Steel Co., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Sivyer Steel Casting Co., Milwaukee, Wis.
United Steel Co., Canton, O.
Vanadium Alloys Steel Co., Latrobe, Pa.

STILLS.
(Ammonia.)
Koppers Co., H., Chicago, Ill.

WHERE TO BUY

STOKERS.
Erie Foundry Co., Erie, Pa.
Green Engrg. Co., Chicago, Ill.
Rosedale Fdy. & Mch. Co., Pittsburgh, Pa.

STONES.
(Oil.)
Norton Co., Worcester, Mass.

STONES.
(Rubbing and Sharpening.)
Norton Co., Worcester, Mass.

STORAGE MACHINERY.
(Coal.)
Jeffrey Mfg. Co., Columbus, O.

STUDDING.
(Metal.)
Youngstown Iron & Steel Co., Youngstown, O.

SWITCHES.
(Electrical.)
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., Cleveland.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Pittsburgh

SWITCHES.
(Magnetic.)
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Pittsburgh

SWITCHES.
(Solenoid.)
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.

TABLES.
(Drawing.)
Economy Drawing Table Co., Toledo, O.

TABLES.
(Rolling Mill.)
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
United Engrg. & Fdy. Co., Pittsburgh.

TANKS AND TOWERS.
American Annealing Box Co., Canton, O.
American Welding Co., Carbondale, Pa.
Blaw Steel Centering Co., Pittsburgh, Pa.
Des Moines Bridge & Iron Co.,
Des Moines, Ia., and Pittsburgh, Pa.
Freeman, S., & Sons Mfg. Co., Racine, Wis.
Graver Tank Wks., Wm., East Chicago, Ind.
Pennsylvania Boiler Works, Erie, Pa.
Riter-Conley Mfg. Co., Pittsburgh, Pa.
Struthers-Wells Co., Warren, Pa.
Western Drop Forge Co., Marion, Ind.

TANKS.
(Water and Acid Storage, Wire Mills.)
Struthers-Wells Co., Warren, Pa.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

TAR EXTRACTORS.
Koppers Co., H., Chicago, Ill.

TEETH.
(Steel Harrow.)
Inland Steel Co., Chicago, Ill.

THERMOMETERS.
Brown Instrument Co., Philadelphia, Pa.

TILE.
(Fire Clay, Furnace, Etc.)
Ashland Fire Brick Co., Ashland, Ky.
Union Mining Co., Mt. Savage, Md.

TINNING.
(Custom Work.)
Geuder, Paeschke & Frey Co., Milwaukee.

TITANIUM.
Titanium Alloy Mfg. Co., Pittsburgh, Pa.

TOOLS.
(Machinists'.)
Morse Twist Drill & Mch. Co.,
New Bedford, Mass.

TOOLS.
(Pneumatic.)
Cleveland Pneumatic Tool Co., Cleveland, O.
Ingersoll-Rand Co., New York.
Ryerson, Joseph T., & Sons, Chicago, Ill.

TOOLS.
(Thread Cutting.)
Landis Machine Co., Waynesboro, Pa.

TORCHES.
(Shop.)
Dayton Malleable Iron Co., Dayton, O.

TRACK.
(Industrial.)
Atlas Car & Mfg. Co., Cleveland, O.
Chase Foundry & Mfg. Co., Columbus, O.
Industrial Car Co., West Park, O.

TRAMRAILS.
(Overhead Systems.)
Brown Hoisting Machinery Co., Cleveland, O.
Northern Engrg. Works, Detroit, Mich.
Philadelphia Tramrail Co., Philadelphia, Pa.
Whiting Foundry Equip. Co., Harvey, Ill.

TRANSMISSION EQUIPMENT.
(Power.)
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Oneida Steel Pulley Co., Oneida, N. Y.
Westinghouse Electric & Mfg. Co., Pittsburgh

TRAPS.
(Steam.)
McAuley Automatic Trap Co., Pittsburgh, Pa.
National Tube Co., Pittsburgh, Pa.
Strong, Carlisle & Hammond Co., Cleveland.

TROLLEYS.
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Browning, Victor R., Co., Cleveland, O.
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National Tube Co., Pittsburgh, Pa.
Shepard Electric Crane & Hoist Co.,
Montour Falls, N. Y.
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(Foundry.)
Sterling Wheelbarrow Co., West Allis, Wis.

TRUCKS.
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TRUCKS.
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National Tube Co., Pittsburgh, Pa.
Republic Iron & Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, O.

TUBES.
(Boiler.)
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Andrews Steel Co., Newport, Ky.
Bourne-Fuller Co., Cleveland, O.
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Bourne-Fuller Co., Cleveland, O.
Cleveland City Forge & Iron Co., Cleveland.
Milton Mfg. Co., Milton, Pa.
Republic Iron & Steel Co., Youngstown, O.
Russell, Burdsall & Ward Bolt & Nut Co.,
Port Chester, N. Y.

TURN TABLES.
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Chase Fdy. & Mfg. Co., Columbus, O.

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Illinois Malleable Iron Co., Chicago, Ill.
(Nokoros.)
National Tube Co., Pittsburgh, Pa.

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Homestead Valve Mfg. Co., Pittsburgh, Pa.
Locke Regulator Co., Salem, Mass.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
National Tube Co., Pittsburgh, Pa.
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Shaw-Kendall Engrg. Co., Toledo, O.
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American Vanadium Co., Pittsburgh, Pa.

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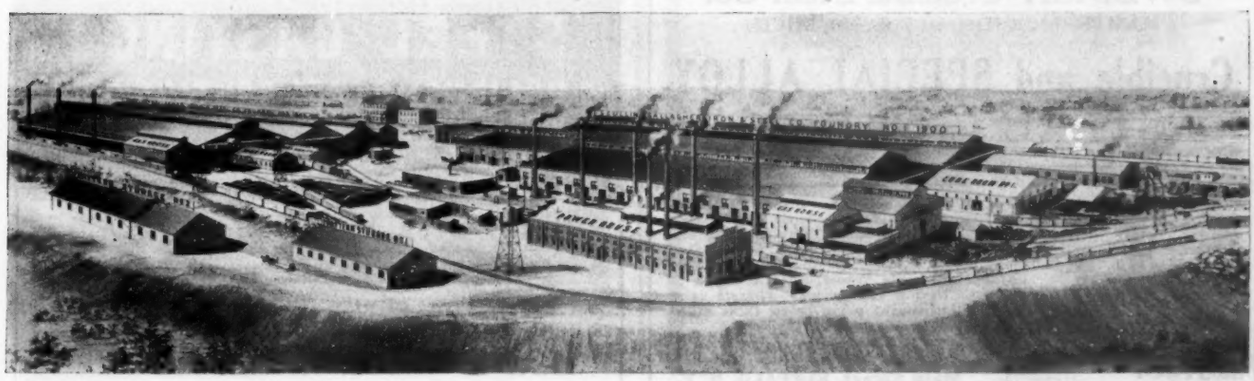

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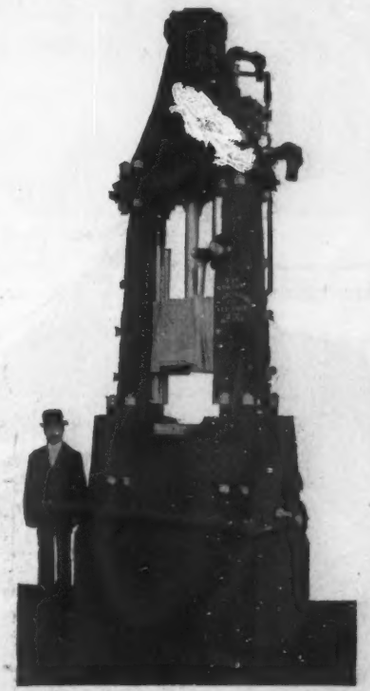

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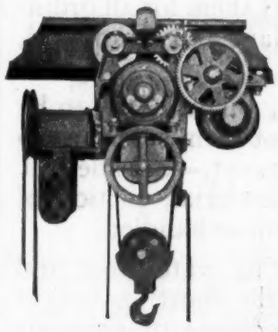

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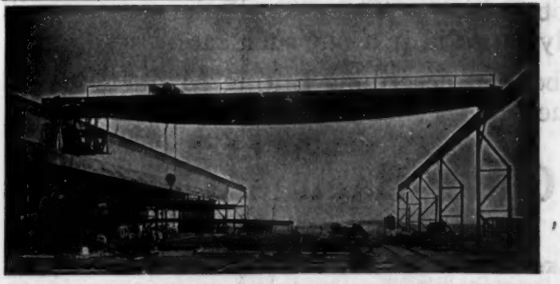

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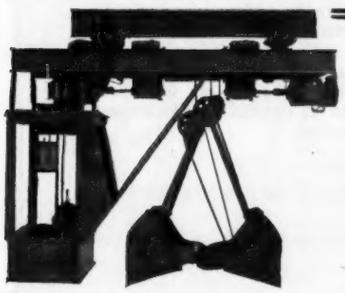

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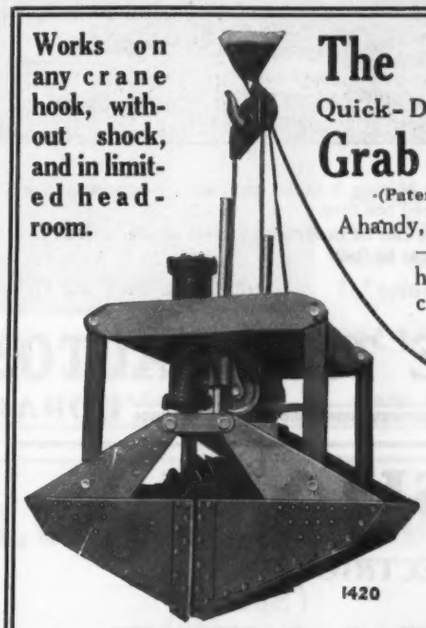

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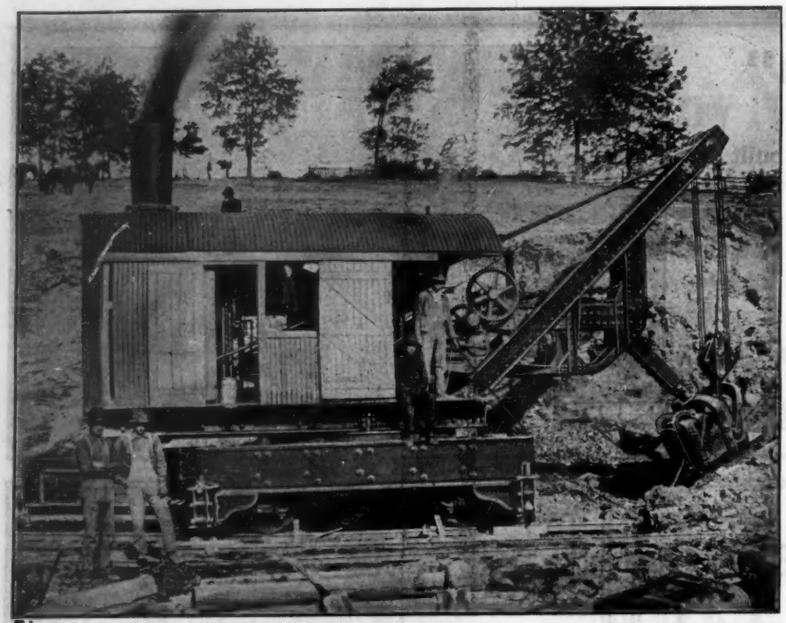

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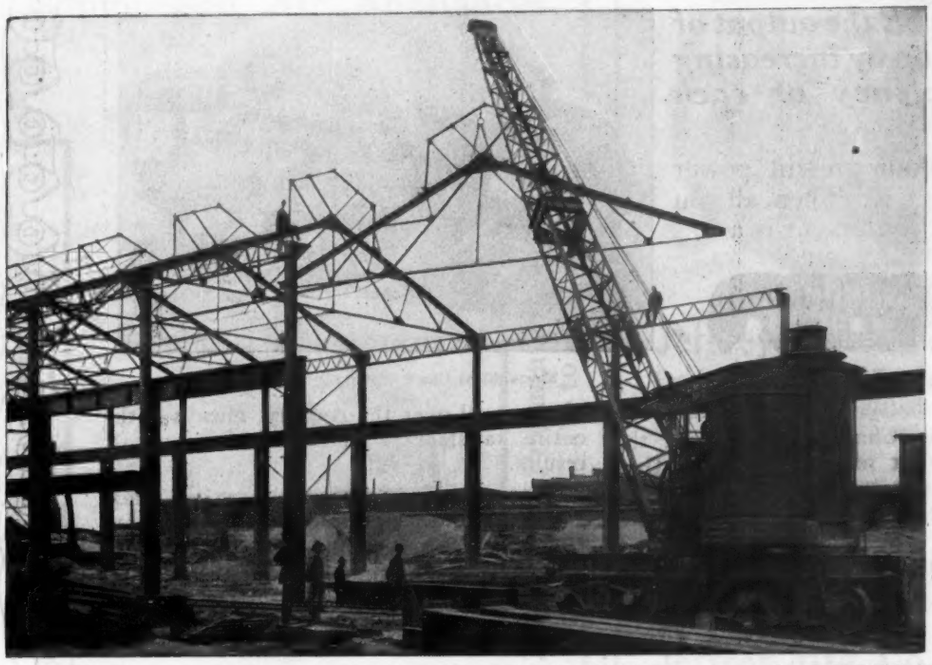

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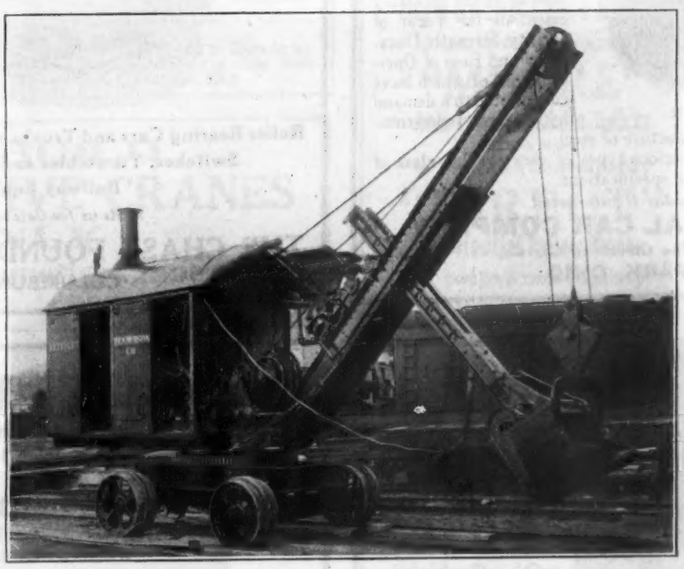

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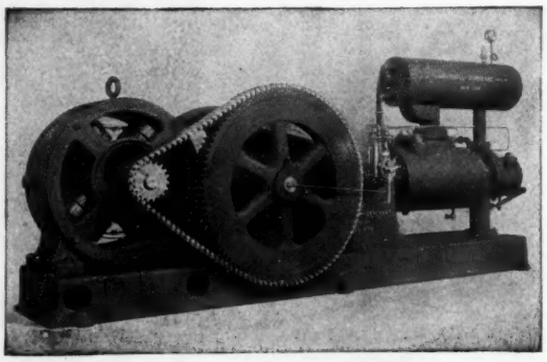

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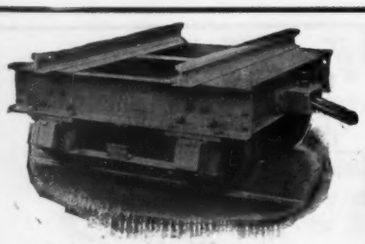

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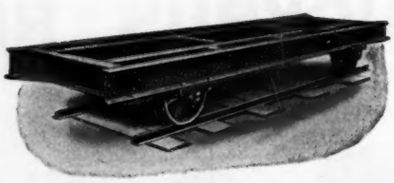

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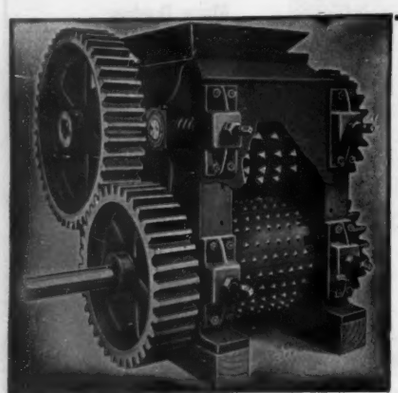

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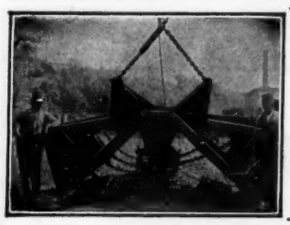

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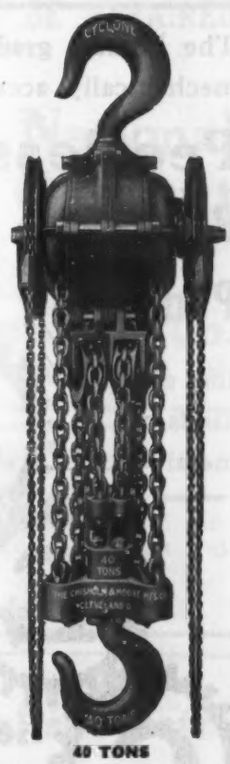

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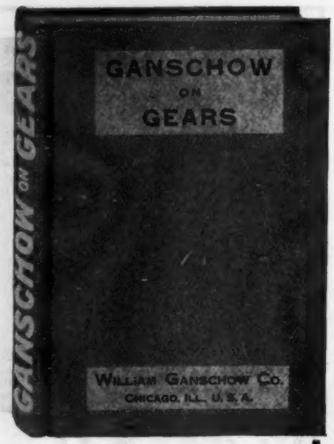

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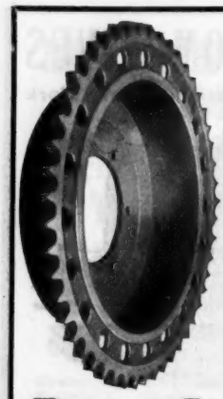

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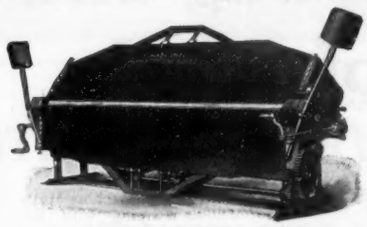

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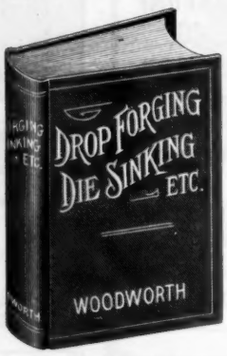

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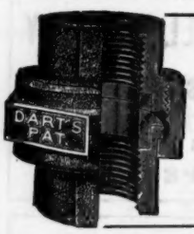

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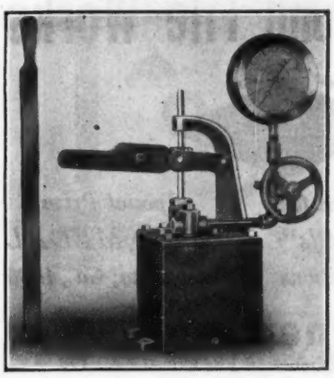

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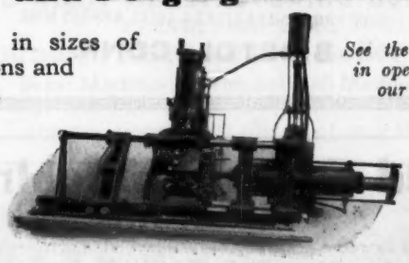

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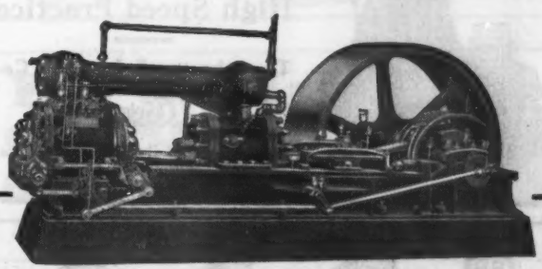

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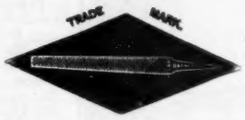

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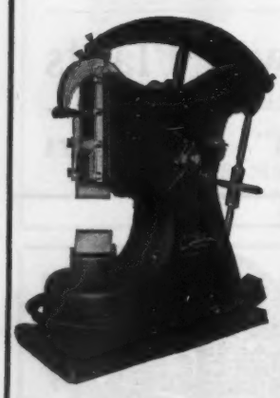

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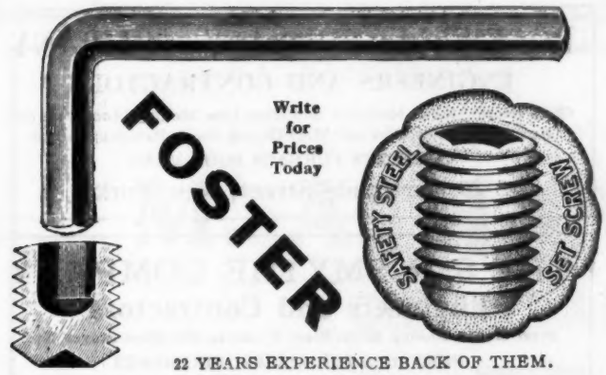

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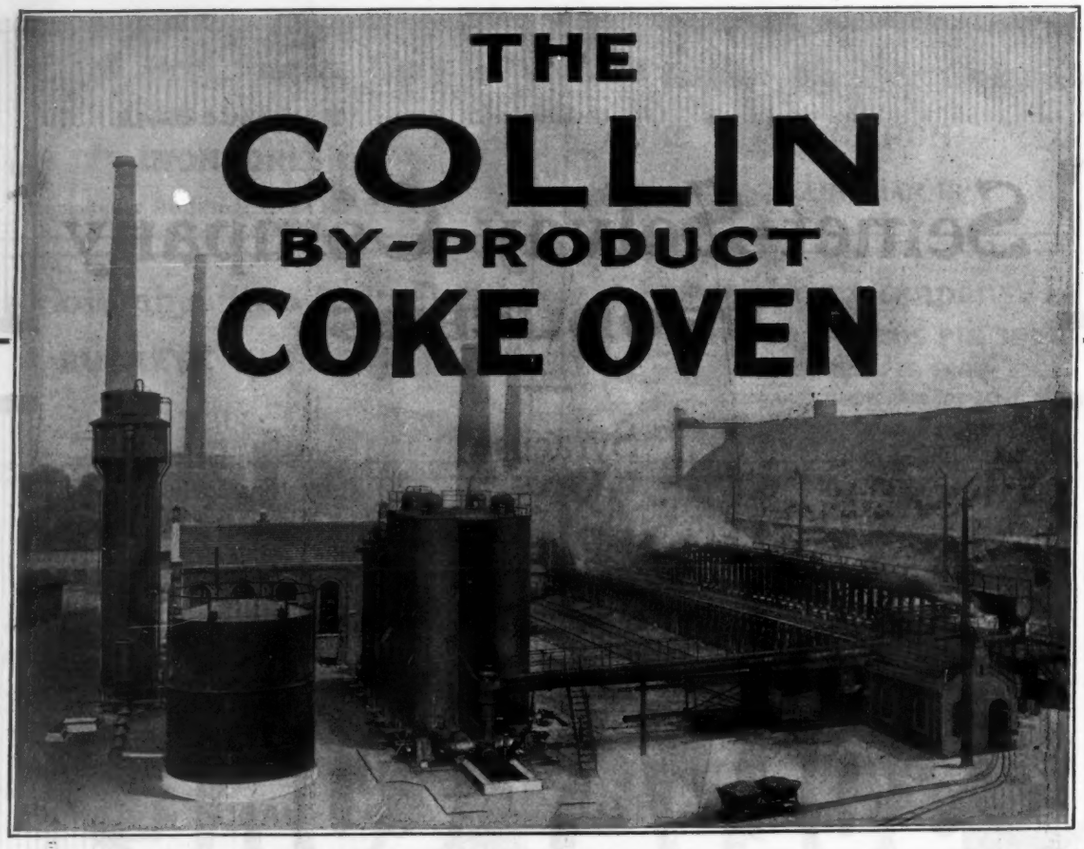

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16 x 6 Reed, rise and fall rest, good condition (2)
18 x 8 Fay & Scott, comp. rest, late type, first class
18 x 8 Walcott & Wood, comp. rest, first class condition
18 x 8 Lodge & Davis, comp. rest, taper attachment, very good condition
18 x 10 Schumacher & Boye, chuck, comp. rest, first class condition
22 x 12 Pond, comp. rest, chuck, good condition
22 x 16 Pond, comp. rest, fair condition
24 x 14 H. B. Fish, comp. rest lathe and chuck, good condition
36 x 16 New Haven, comp. rest, fair shape
38 x 24 New Haven, comp. rest, chuck jaws, attachments, good condition
48 x 34 Niles, triple geared, comp. rest, raising blocks, steady rests, good condition
60 in. x 16 ft. Fifield comp. rest, very good
Roll lathe, 39 in. swing by 9 ft. centers, good condition

MILLING MACHINES

No. 1 Eynon universal, good condition, no attachments
No. 3½ Garvin plain, with arbor and vise, good condition
No. 3 Cincinnati plain, belt feed, first class condition

PLANERS

15 in. Bush, crank, good shape
22 x 22 x 4 New Haven, single head, first class condition
22 x 22 x 6 Gray, single head, good condition (2)
24 x 24 x 6 Ohio, single head, first class condition
24 x 24 x 8 Powell, single head, good condition
30 x 8 Detrick & Harvey, open side, two heads, good condition
32 x 32 x 8 Lodge & Davis, single head, fair condition
36 x 36 x 8 Sellers, spiral drive, single head, good condition
48 x 48 x 16 Detrick & Harvey, open side, two heads, very good condition

SHAPERS

15 in. Hendey, friction, with vise, first class condition (2)
16 in. Flather, gear box drive, latest model, first class condition
16 in. Gould & Eberhardt, back geared, good condition (2)
24 in. Queen City, crank, good as new
20 in. Kelly, latest type, good as new, with vise
20 in. Hendey, friction, first class condition, with vise
22 in. Smith & Mills, shifting belt, first class condition
24 in. Hendey, friction, with vise, good condition
24 in. Smith & Mills, shifting belt, first class condition
26 in. Lodge & Davis, shifting belt, fair condition
26 in. Cincinnati, shifting belt, very good condition

TURRET LATHES AND SCREW MACHINES

No. 4 Pratt & Whitney chucking machine, fair condition
2 x 24 in. Jones & Lamson, sliding head, very good condition
4¼ in. Cleveland auto., latest type, 1st class shape, collets, pads and equipment
21 in. Gisholt, latest type, first class condition, with equipment
21 in. Gisholt, old type, good condition
Davis 24 x 24 in. chucking machine, first class
24 x 10 Lodge & Shipley turret, good condition
28 in. Gisholt, late type, power rapid traverse, good condition

MISCELLANEOUS

Bending machine, belt driven, weight about 8,500 lbs., good condition
Bolt cutter, 2 in. Acme, good condition, with dies
Cold saws, No. 1 Burr, very good condition (2)
Grinder, motor driven, 12 x 2 in. Ransom, first class condition
Hammer, tire welding, No. 35 Williams White, good condition
Hammer, drop, 1200 lbs. Billings Spencer
Keyseater, No. 3 Mitts & Merrill, first class condition, with equipment
Keyseater, 18 x 1½ in. Morton, with bars and cutters, good condition
Pattern makers' lathes, 20 in. x 8 ft. swing (2)
Pipe machine, lathe bed type, 6 in. Saunders, in good condition
Pipe machine, 12 in. Curtis, with dies, very good condition
Planer, portable, Morton, electric drive, 40 in. stroke, good condition
Press, No. 19 Stiles & Parker, inclinable, 2 in. stroke first class condition
Riveter, pneumatic, 10 in. stroke, good condition
Slotter, 8 in. Newton, in good condition
Tapper, Pratt & Whitney, good condition

THE MOTCH & MERRYWEATHER MACHINERY CO.

CLEVELAND

DETROIT CINCINNATI PITTSBURGH

Illinois Smelting & Refining Co.

MANUFACTURERS, SMELTERS AND DEALERS.

COPPER TIN **METALS.** BRASS ANTIMONY

OFFICE & WORKS N.W. COR. KINZIE & PEORIA STREETS

LONG DISTANCE TELEPHONE MONROE 723.

Chicago, August 25, 1911

The Iron Trade Review,
Cleveland, Ohio.

Dear Sirs;-

We are enclosing herewith your invoice of August 21st. and would ask that you discontinue this Ad as we have had far too much noise from it already. Your prompt attention to this matter will be appreciated.

Yours truly,
ILLINOIS SMELTING & REFINING CO
M. Weill, President

This is the ad—

WANTED

For spot cash, 58-60" Cupola. Must be new or in good condition. 25 H. P. Motor. 1 No. 8 Sturtevant Blower. 1 Crane 30 ft. long with motor and fully equipped. Must be in good order. Three to four ton Ladle.

Monroe 723

Illinois Smelting & Refining Co.
CHICAGO, ILL.

appeared in only one issue

RESULTS?
What do you think?
Is it worth YOUR consideration?
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BUSINESS OPPORTUNITIES

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Wanted and For Sale
Agencies Wanted and Open. Auction Sales
Miscellaneous Advertisements

RATES and RULES

1 inch	—1 time	$1.40
2 inches	—1 time	2.60
4 inches	—1 time	4.80
8 inches	—1 time	9.00

No advertisement accepted for less than $1.40

Orders for less than four insertions should be accompanied by CASH—it saves bookkeeping. Advertisements for July 4th issue must be received not later than June 20th.

COMPLETE MODERN FOUNDRY AND machine shop plant of five acres, for sale—On Wabash-Pere Marquette tracks, private siding, track scales, 75-ton cupola, steel, concrete and brick buildings, separate power plant, electric lights, sprinkler system with tower tank, Babcock & Wilcox boiler; Corliss Engine. For blue prints and full description write City & Suburban Homes Co., Ltd., 200 Griswold St., Detroit, Mich.

FOUNDRY AND MACHINE SHOP FOR sale—Good location—doing a good business. Price $5,000 if sold quick. Address D. E. Foltz & Son, Shreve, Ohio.

GREAT OPPORTUNITY — FOUNDRY, machine shop, sheet metal works for sale—In operation thirty years. Complete equipment, machines, tools and stock. Now running—without shut-down for sixteen years. Good business. Fine location. Fullest Investigation invited. Rare chance. Address YORK FOUNDRY & ENGINE WORKS, York, Nebraska.

SMALL JOBBING FOUNDRY AND MAchine shop for sale. Address J. W. Fischer, Fayette, Mo.

La SOCIETE ANONYME des ETABLISsements Ph. Bonvillain & E. Ronceray, 9 and 11 Rue des Envierges, Paris (France), announce that they have bought back the Patent right for the Universal System of Machine Moulding, also their System of Pattern Plate Making. They are ready to consider offers from a reliable American firm to handle this line of equipment, which has been greatly improved during the past 12 months. The Universal System has been applied at a considerable extent abroad for making moulds for all kinds of castings from those weighing a few ounces to several tons.

WANTED — MALLEABLE IRON OR cast steel foundry to occupy idle manufacturing plant splendidly located on Hudson river near New York City. Owners are large users of these products and would consider part or full payment of property in purchases. Plant has been used for other purposes, but is well adapted to foundry work. Address DAHL, 78 Wall street, New York City.

FOR SALE AT A GREAT BARGAIN— Twenty-one stripping machines with patterns for soil pipe, core boxes, trays and master flasks for same, besides a complete line of sinks with follow boards. Plymouth Foundry, Plymouth, Mass.

ANALYSES, ASSAYS, SAMPLING OF iron, ores, coal, coke, etc. Address Dover Laboratory, Dover, N. J.

Mr. New Incorporator

Keep your eyes on these pages, if you are on the lookout for Machinery Bargains.

If it's in the Machinery Line you'll find it listed here.

Get the habit

FOR SALE

Foundry, equipped for brass, aluminum and iron. At Indianapolis.

Address **J. F. Boesinger,** Receiver
815 State Life Bldg.
Indianapolis, Indiana

We are in the market for partially developed iron mines with good prospects and at this time particularly want a property on which a large, high grade ore body has been drilled or othewise explored."

Address
Mining Department, Breitung & Co., Ltd Marquette, Mich.

THE BUYER AND SELLER

are reached more quickly and economically through the columns of

THE IRON TRADE REVIEW

than any other medium
Rates—$1.40 per inch
Better send ad. today for next issue

I Invite Correspondence

looking to my representing in Germany and on the continent an American manufacturer of Machinery and Tools. Am a native and now residing in Germany, with an extensive acquaintance and experience in that line. References best possible.

Address "German"
The Iron Trade Review
CLEVELAND, O.

GET THE HABIT

of mentioning the
MACHINERY EXCHANGE
when writing advertisers
Bound to do us both good

WE BUY and SELL EVERYTHING

In old Scrap Material. No quantity too large or too small. Over 25,000 ft. of
Good Second Hand Pipe for Sale
Will cut any length to suit your requirements.
H. KANDER & CO., Bowling Green, O.

N. O. Nelson Mfg. Co., Agents, St. Louis, Mo.

FOR SALE
A Well Equipped Jobbing Foundry

A well equipped jobbing foundry covering 6¾ acres, fenced in, located in the Borough of Catasauqua, Lehigh County, Pennsylvania. Plant has excellent railroad facilities, being connected with the Central R. R. of N. J., the Lehigh Valley R. R. and the Philadelphia & Reading R. R., being 92 miles from New York and 65 miles from Philadelphia. Equipment consists of 2 cupolas, aggregate capacity 26 tons per hour; 4 power cranes and 5 hand cranes; moulding machine; pattern shop equipment with fire-proof pattern storage and machine shop, together with other small machines too numerous to mention.

For particulars inquire of

Mr. Edwin Thomas, Trustee
CATASAUQUA, PA.

ECONOMY

plays an important part when you want to buy or sell some second-hand equipment. For $1.40 per inch over 6,000 Buyers are reached who are readers of

THE IRON TRADE REVIEW

Better send the ad today for the next issue

Iron Ore Lands for Sale.

Undivided ½ of 160 acres South East ¼ Sec. 17-62-14 St. Louis Co., Minn.

ADDRESS ALL INQUIRIES TO
John Barsby, 5609 Euclid Ave., Cleveland O.

FOR SALE CHEAP

A Well Equipped Boiler Shop, in Western Pennsylvania.

Six blast furnaces within half a mile, other iron works in the neighborhood. Present owners have other business. Small payment down. A splendid opportunity. Address

Box 836, The Iron Trade Review, Cleveland, O.

$ and ¢
SAVED

plays a prominent part, when you tell the 6,000 readers of **THE IRON TRADE REVIEW** what you have to offer in second-hand Machinery for only $1.40 per inch.

A Good Position For You may be listed in one of the ads. on this page. Better read them all over and find it. If not—an ad. will let the others know your want.

RATES AND RULES

"Help Wanted" or "Positions Wanted" ads, 2 cents per word (address counts as eight words). No advertisement for less than 50 cents and CASH with order ALWAYS—it saves book-keeping. Do not word your advertisement as you would a telegram. In our experience we find that the quickest results have only been obtained when advertisements have been plainly worded. The saving of a few cents may prove to be the losing of a good position. Send your advertisement before Saturday, June 29th, if you want it to appear in July 4th issue.

MAKE IT A POINT every week to read these pages. It is a part of the service you are paying for.

Help Wanted

GENERAL SUPERINTENDENT WANTED. For stave factory and foundries.—The position offered in this advertisement is created by the development of the business and not by the retirement of a previous superintendent. The highest order of talent in stove manufacturing, will find unlimited opportunity and the salary will be made to correspond with the evidence of the ability of the successful applicant from his previous experience. Assurance is given applicants that there will be no violation of the confidences submitted in answering this advertisement. Address Box 785, THE IRON TRADE REVIEW, Cleveland, O.

PATTERNMAKERS WANTED IN WOOD and metal for both heavy and light engine work. Experienced and skillful men wanted. Address with statement of experience and present employment. The Westinghouse Foundry Co., Trafford, Pa.

MOLDERS WANTED FOR BOTH heavy and light engine work in gray iron. Address with statement of experience, etc. The Westinghouse Foundry Co., Trafford, Pa.

A RELIABLE MAN WANTED TO TAKE charge of our core making room, must be familiar with gas stove burner cores. Give experience, and furnish references, also state salary wanted. Address Bridge & Beach Mfg. Co., St. Louis, Mo.

COMMISSION AGENT WANTED TO sell gray iron castings in Cleveland and surrounding territory, as a side line. Must be capable of making good sketches. Box 863, THE IRON TRADE REVIEW, Cleveland, O.

INSTRUCTOR IN FURNACE AND mill machinery, (mechanical part of steel works) wanted by engineering school in western Pennsylvania. Technical graduate with at least six years of practical experience preferred. Excellent opportunity for right man. Address Box 883, THE IRON TRADE REVIEW, Cleveland, O.

FOREMAN PATTERN MAKER WANTED, strictly high grade in both wood and metal, malleable or gray iron. Experienced in agricultural implements. Address Box 885, THE IRON TRADE REVIEW, Cleveland.

SUPERINTENDENT FOR BRASS, bronze and aluminum foundry doing a general job work. Capacity 2,000 to 4,000 pounds per day. Must have experience and be able to figure costs and quotations safely. Satisfactory salary, and interest in the business to the right man. Send references. Address E. O. H., 106½ West Third street, Marion, Ind.

Help Wanted

EXPERIENCED FOREMAN, FIRST-class, wanted for malleable foundry near Mississippi river. State experience and salary expected. Address Box 696, THE IRON TRADE REVIEW, Cleveland, O.

SEVERAL FIRST-CLASS DRAFTSMEN and designers wanted, familiar with mill and furnace work. Pittsburgh district. Good pay for capable men. In reply give experience in detail, age and salary wanted. Address Box 695, THE IRON TRADE REVIEW, Cleveland, O.

THOROUGHLY COMPETENT AND capable man wanted to act as superintendent in a newly erected and modern drop forge plant, fully equipped with all new and up-to-date machinery. Must be experienced in figuring cost and giving estimates. Also be in a position to take a reasonable amount of stock, in the company. Address Box 694, THE IRON TRADE REVIEW, Cleveland.

SAND BLAST OPERATORS — STEADY work, good pay for experienced operators, preferably men who have operated "Pangborn" modern installations. Give full particulars of experience, places and periods of employment, also wages expected. Address Box 765, THE IRON TRADE REVIEW, Cleveland, O.

SUPERINTENDENT WANTED FOR A large new foundry proposition in central Massachusetts, for making heavy high class machine tool castings. None but experienced, successful men need apply to address Box 744, THE IRON TRADE REVIEW, Cleveland, O.

WE WANT AN EXPERIENCED GEN-eral foreman for grey iron foundry where agricultural implements are manufactured. Must be a man of sterling character, of good executive ability who thoroughly understands mixing of iron from analysis, molding and molding machines. Will only consider applicants of years of experience and unquestionable character. Position now open. Must be filled at once. State age, salary expected and where now employed. Correspondence strictly confidential. Address Box 808, THE IRON TRADE REVIEW, Cleveland, O.

HIGH GRADE SALESMAN WITH splendid experience, is opening a sales office in Chicago, and will consider handling one or two good accounts in that territory. Will handle either raw material or finished products. This is a splendid opportunity for party wishing to increase their tonnage in that market. Address Box 864, THE IRON TRADE REVIEW, Cleveland, O.

FOREMAN WANTED IN DEPARTMENT rolling light, cold rolled strip steel and flat wire all sizes including pickling, annealing, slitting and coiling. Address Box 871, THE IRON TRADE REVIEW, Cleveland, O.

Help Wanted

WORKING FOREMAN WANTED FOR a foundry in southwest Texas. Write stating experience and ability, and former employers. Address Box 814, THE IRON TRADE REVIEW, Cleveland, O.

PATTERN MAKER WANTED, WORK-ing foreman for seven pattern makers. Require man with malleable experience. State age, experience and salary wanted. Jewell Steel & Malleable Co., Buffalo, N. Y.

AN EXPERIENCED SALESMAN WANT-ed, by an established house, to represent them on house heating boilers and furnaces. Man acquainted with New England trade preferred. Address Box 717, THE IRON TRADE REVIEW, Cleveland, O.

A THOROUGH MECHANIC WANTED, understanding good foundry practice, together with Schwartz furnace. Must be a molder, and not over 30 years old. To take charge of a foundry making brass and iron valves. In first letter state experience, giving names, dates, etc., as closely as possible, also schools, or night schools, if any. Address Box 1754, Pittsburgh, Pa.

FOREMAN FOR GRAY IRON FOUN-dry, manufacturing screwed pipe fittings, valves, etc., must be able to handle men to best advantage to get the greatest output at minimum cost. Must understand machine molding. State age, previous experience, salary expected, and give references. Jarecki Mfg. Co., Foundry Dept., Erie, Pa.

A FOREMAN CAPABLE OF TAKING charge of a steel casting foundry making light and medium work wanted. Need not have knowledge of melting steel but must be up in modern methods of molding, core making facing and general steel foundry practice. State experience and salary wanted. Address Box 858, THE IRON TRADE REVIEW, Cleveland, O.

FOREMAN WANTED TO TAKE CHARGE of Wood Screw Department. Must be experienced and a good mechanic. State experience, salary expected, age, etc. Address Box 862, THE IRON TRADE REVIEW, Cleveland, O.

COMPETENT FOUNDRY FOREMAN wanted. Must thoroughly understand molding and cupola practice and iron mixture. We want a high class competent resourceful man and are willing to pay enough to get the man we want. Address Box 826, THE IRON TRADE REVIEW, Cleveland, O.

RESPONSIBLE EXPERIENCED MAN wanted, as assistant superintendent in grey iron foundry, making principally automobile cylinders. Permanent position for right man. Plant located Buffalo, N. Y. State experience, age, references, etc. Address S. H., THE IRON TRADE REVIEW, Cleveland, O.

FIRST CLASS FOUNDRY COST CLERK wanted. The Prime Steel Co., Milwaukee, Wis.

IT is surprising how far these liner ads travel---a few weeks ago a firm in Washington engaged a man from New York for a responsible position due to an ad in this department.

RATES AND RULES

"Positions Wanted" or "Help Wanted" ads 2 cents for each word (the address counts for eight words).
No advertisement for less than 50 cents and ***cash*** with order ***always***—it saves book-keeping.
Do not word your advertisement as you would a telegram. In our experience we find that the quickest results have only been obtained when advertisements have been plainly worded. This will save you time and unnecessary correspondence. Send your letter before Saturday, June 29th, if you want to get in July 4th issue

Termaat & Monahan Company
OSHKOSH, WIS.

June 3rd, 1912

The Iron Trade Review,
Cleveland, O.

Gentlemen:

The ad. for a foundry foreman in The Iron Trade Review has brought the desired results.

Yours very truly,
W. J. Kuehn, Mgr.

Positions Wanted

AS FOREMAN OF CRUCIBLE STEEL foundry, position wanted. Can do melting and mixing of all special alloy steels, capable of installing new plant. Sober, ambitious. Address Box 668, THE IRON TRADE REVIEW, Cleveland, O.

POSITION WANTED AS FOREMAN pattern maker. First-class experience in all kinds of gas, steam engine, light and heavy machinery, and molding machine work. Address Box 770, THE IRON TRADE REVIEW. Cleveland, O.

FOREMAN CORE MAKER POSITION wanted. Gas engine cylinders a specialty. A-1 references. Address Box 780, THE IRON TRADE REVIEW, Cleveland, O.

CHIEF ELECTRICIAN, POSITION wanted, with foundry company. Have had 12 years practical experience with electric equipment in foundry. Address Box 676, THE IRON TRADE REVIEW. Cleveland.

FOUNDRY FOREMAN DESIRES TO make a change. At present foreman of a gray iron foundry, employing 150 men, making high grade heavy and light castings. I can put any foundry in good shape and keep it that way. Mississippi Valley preferred. Address Box 703, THE IRON TRADE REVIEW. Cleveland. O.

FOUNDRY FOREMAN POSITION wanted in shop making steel castings. Can handle men and give best reference. Temperate and right man for right place. Address F. S., THE IRON TRADE REVIEW, Cleveland, O.

SITUATION WANTED. PRACTICAL foundryman with 20 years experience in plumbers' supplies, steam fitters' goods, builders' hardware and general jobbing, is open for engagement. Reference furnished. Address Box 801, THE IRON TRADE REVIEW, Cleveland, O.

A FOUNDRY EXPERT, EXPERIENCED in iron, bronze, aluminum and steel wants to hear from foundry managers who are having difficulty in obtaining results. Write stating difficulty, asking for quotation putting same right; results guaranteed. P. O. Box 53, Verona, Pa.

MANAGER, MAN 31, 17 YEARS' EXperience in the manufacture of light and heavy machinery and architectural iron castings, abstainer from all intoxicants, honest, unblemished moral character, with energy and executive ability, and good common sense, offers his services as business manager of good foundry. Address Box 810, THE IRON TRADE REVIEW, Cleveland, O.

ASSISTANT TO MANAGER OR SUperintendent of malleable foundry desired by technical graduate, with five years' first-class experience. Best of references. Address Box 821, THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY FOREMAN WISHING TO make change. Experienced on engine and heavy machinery. Loam, green and dry sand. Core and cupola practice. Will deliver the goods as am to receive nothing for my services. You to be the judge. Modern shop only. Write me. Address Box 824, THE IRON TRADE REVIEW, Cleveland. O.

POSITION WANTED BY A MAN WHO understands the crucible steel casting business thoroughly, a practical molder and understands the furnaces and metal. Address Box 847, THE IRON TRADE REVIEW, Cleveland, O.

A MOLDER WITH LONG EXPERIence wishes position as working foreman in some small jobbing or machinery foundry. Address Box 828, THE IRON TRADE REVIEW, Cleveland. O.

POSITION WANTED BY HIGH GRADE mounting room foreman—good executive ability and handler of men. Address Box 833, THE IRON TRADE REVIEW, Cleveland, O.

Positions Wanted

SUPERINTENDENT POSITION wanted. You need a man in your foundry, knows how to mix iron by analysis, can make semi-steel by McLain's system, up-to-date cupola practice; 16 years' experience in foundry, can handle large number of men to good advantage. Good references. Address Box 807, THE IRON TRADE REVIEW, Cleveland, O.

A FOUNDRY FOREMAN DESIRES A position, 11 years' experience as foreman in present position. Stove plate, heating, boilers, or furnace work preferred. Address "A," THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY FOREMAN HAS LONG EXperience on light and heavy work on grey iron, desires position. Up-to-date on grey iron mixture and can furnish best of reference. Have had charge of shop employing 60 molders. Philadelphia or Pennsylvania preferred. Address Box 812, THE IRON TRADE REVIEW, Cleveland, O.

POSITION AS FOUNDRY FOREMAN by young married man, experienced in green and dry sand. Molding machine expert, also cupola practice, in present position 9 years. A-1 references, up-to-date on all gasoline cylinder work. Address Box 820, THE IRON TRADE REVIEW, Cleveland, O.

CHEMIST DESIRES POSITION—EXPErienced in all departments of malleable iron. Good melter; moderate salary. Member A. F. A. and B. F. F. A. Address Box 825, THE IRON TRADE REVIEW, Cleveland, O.

ORNAMENTAL IRON WORK POSITION wanted as general foreman or foreman patternmaker by a thoroughly experienced man with first class references. Eastern states preferred. Address Box 816, THE IRON TRADE REVIEW, Cleveland, O.

FIRST CLASS CONVERTER STEEL foundry foreman desires position, can handle everything in connection with such process. Expert in molding, able to take entire responsibility of the maintenance of the converter, melting, blowing and cleaning department. Thoroughly familiar with piece work and bonus system. Eighteen years as foreman, wish position with a live and energetic shop, where results count. Box 819, THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY SUPERINTENDENT, OR foreman of recognized ability familiar with heavy and light castings, molding machines, cupola practice and economical output with 20 years experience as superintendent and foreman is open to engagement. First-class recommendations and references. Address Box 817, THE IRON TRADE REVIEW, Cleveland, O.

POSITION WANTED AS FOREMAN OR superintendent of brass foundry, over 21 years' experience in brass and aluminum. A good metal mixer and first class mechanic, strictly temperate, and steady. First class references on application. Address Box 818, THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY FOREMAN AT PRESENT employed, would like to make a change; up-to-date on water heaters, stove plate, jobbing, soil pipes and fittings. A No. 1 on cupola practice, good references as to ability and character; am married. Capable of putting any foundry in first class condition. Address "H. J.," THE IRON TRADE REVIEW, Cleveland, O.

MALLEABLE IRON SUPERINTENDent, at present employed, desires a change Successful record in heavy or light castings A 1 reference. Address Box 813, THE IRON TRADE REVIEW, Cleveland, O.

Positions Wanted

AN AGGRESSIVE, ENERGETIC, UP-TO-date, high-grade thoroughly practical foundryman, one who can fully deliver all that the foregoing implies, desires to make a change and is seeking a position as superintendent or manager of a company, requiring a man of more than average ability. Excellent past record. References as to character and qualifications. Address "Aggressive," THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY FOREMAN OF OPEN-hearth steel foundry. 23 years' experience, strictly sober. Best references. Address Box 367, THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY SYSTEM AND COST MAN desires change. Experienced in foundry and machine shop systems. Young, energetic and reliable. Address Box 832, THE IRON TRADE REVIEW, Cleveland, O.

A GRAY IRON FOUNDRYMAN OF wide experience capable of handling the business and productive ends desires a change affording greater responsibilities. An interview is all I ask. Address Box 860, THE IRON TRADE REVIEW, Cleveland, O.

AS FOREMAN IN BRASS, IRON OR steel foundry; 17 years' experience. Mix metals by analysis. Handle men successfully. Best references. Address C. P. K., 115 West Eleventh St., New York, N. Y.

POSITION WANTED AS FOREMAN BY a practical molder of 14 years' experience on marine and gas engines, light and heavy machinery castings. Have handled jarring machines. Graduate of McLain's System. Twenty-eight years of age. Married. Strictly temperate, hustler. Will work for best interest of firm. Address Box 835, THE IRON TRADE REVIEW, Cleveland, O.

WELL KNOWN STEEL FOUNDRYMAN solicits correspondence from concerns in need of a high grade foundry manager. Unusual experience in all details of the business, acknowledged expert on converter practice. Can equip and start up your new plant or take charge of existing one and show results. Address Box 839, THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY FOREMAN, POSITION wanted. A-1 references. Address Box 840, THE IRON TRADE REVIEW, Cleveland, O.

MR. WHEEL MAKER: ARE YOU HAVing trouble with high and low chill? Are your losses over two per cent? Are you troubled with the numerous other foundry diseases caused by incompetent supervision over cupola and molders? Then you need a doctor, one who is capable of curing these troubles. I am both capable and competent. Give me an opportunity to prove to you that I am efficient. Address Box 834, THE IRON TRADE REVIEW, Cleveland. O.

POSITION WANTED AS STOREKEEPer in large plant or manager of small plant by man of thirty-six. Have ten years experience in factory supplies and organization and good reference. Address Box 830, THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY FOREMAN, POSITION wanted, as experienced on marine gas, steam engine work and high grade castings. Good executive ability. Graduate of McLain's system. Address Box 823, THE IRON TRADE REVIEW, Cleveland, O.

SITUATION WANTED—FOUNDRY SUperintendent or general foreman. Thoroughly competent both as manager and mechanic. Extensive experience with molding machines, expert in mixtures of gray iron, semi-steel, brass and bronze castings in all classes of work, light, medium or heavy castings. A-1 references as to character and ability. Address Box 876, THE IRON TRADE REVIEW, Cleveland, O.

DEPENDABLE PIG IRON—20

¶ IROQUOIS---Iroquois Iron Co., South Chicago, Ill.

¶ Coke Iron made from a mixture of Lake Superior ores. Part of these ores coming from property owned by the Company, which has extensive holdings of desirable ore lands in the Superior Region.

¶ Brands produced are "Iroquois," "Peerless" and "Sterling Scotch," all low sulphur and high silicon in both Foundry and Scotch grades.

¶ IROQUOIS Malleable is a specialty of the furnace and equally popular among discriminating users.

¶ The company is fortunate in successfully establishing a system of analysis and fracture grading, which seems to be ideal, their object being to meet the growing demand for a silicon graded iron and at the same time to be able to supply promptly fracture graded iron to those desiring it. For example, the Nos. 1, 2 and 3 Foundry irons are divided into two grades, Nos. 1 and 1-X, 2 and 2-X, etc. No. 1 is graded by fracture, while No. 1-X is graded by silicon.

¶ The phosphorus, manganese and sulphur will run practically the same thru all grades, phosphorus .30 to .40, manganese .40 to .60, sulphur in the higher grades .02 to .05.

¶ It can be truthfully said that IROQUOIS and IROQUOIS grading have touched a responsive cord among careful buyers. Sales are made by analysis or fracture grading as desired.

¶ Representative silicons in the analysis grades show the following:

PEERLESS - -	3.00—3.50
STERLING SCOTCH -	2.50—3.00
1-X - - - -	2.25—2.50
2-X - - - -	1.75—2.25
3-X - - - -	1.35—1.75

ROGERS, BROWN & COMPANY

PIG IRON AND COKE

New York
Cincinnati
Chicago
Buffalo
Philadelphia

We represent 50 brands of PIG IRON produced in thirteen different states

ALSO

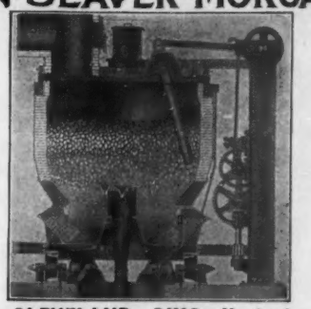
30 brands of 72-hour foundry and furnace COKE, Connellsville, Virginia, Pocahontas, New River, West Virginia, Tennessee, and Kentucky Districts

Boston
St. Louis
Cleveland
Pittsburgh

"Rosiclare" Fluor Spar

THE WELLMAN-SEAVER-MORGAN COMPANY

HUGHES
MECHANICALLY POKED
SELF-CLEANING
CONTINUOUS
GAS PRODUCER



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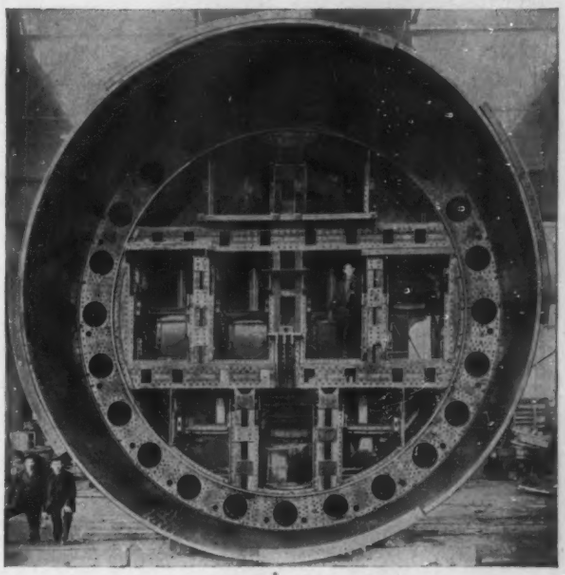

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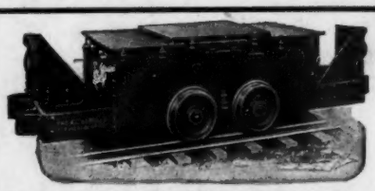

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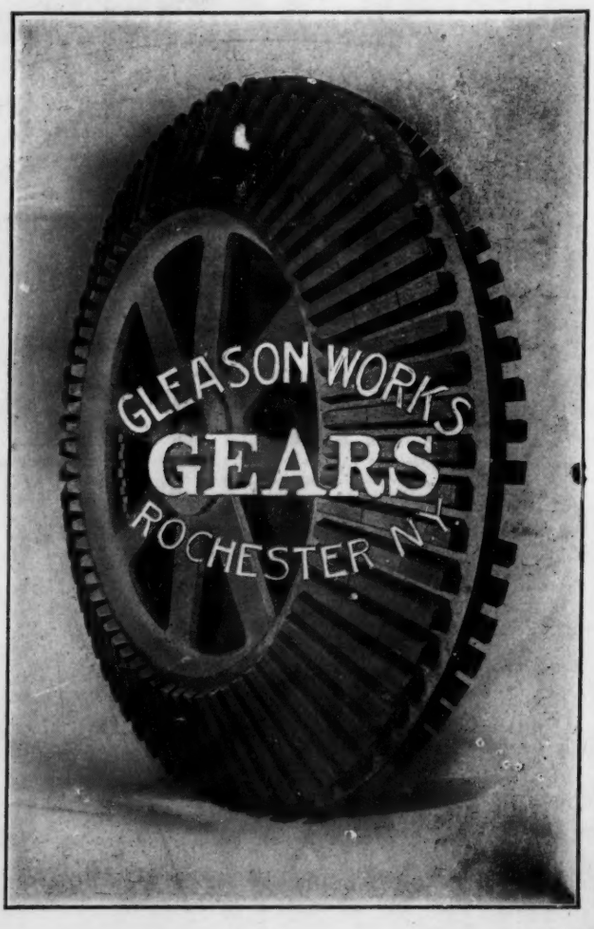
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